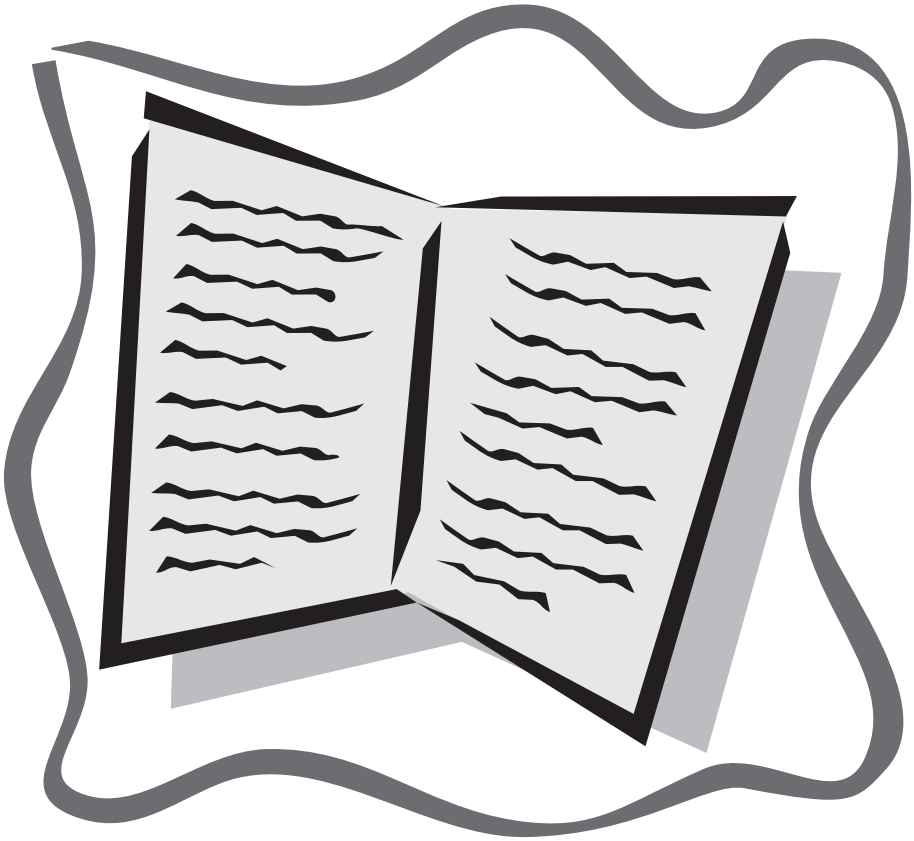
LITERACY

TEACHING LITERACY IN GEOGRAPHY IN YEAR 7

NEW SOUTH WALES
DEPARTMENT
OF EDUCATION
AND TRAINING



Teaching literacy in geography in Year 7

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Curriculum K-12
NEALS
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Acknowledgements

Sandy de Boton	James Ruse Agricultural High School
Sandra Robinson	Consultant
Sue Field	Curriculum Support Directorate
John Gore	Curriculum Support Directorate
Penny Hutton	Curriculum Support Directorate
Paul Hardage	Curriculum Support Directorate

Cover photo: Marrickville High School

SCIS order number: 948511

ISBN: 07313 08263

Product number: 10811

Contents

Chapter 1: The literacy demands of geography

It is period 3 on Wednesday in a Year 7 geography class. The students are continuing their work on the landforms of Japan.

T. Yesterday we looked at the landforms or topography of Japan. What things did we observe? (Writes heading "Topography of Japan" on board.)

S1. There are lots of mountains in Japan.

T. That's right, but what word do we use to describe a country with lots of mountains?

S2. We say "mountainous".

T. Great. (Teacher writes *mountainous* on the board.) In the video we saw yesterday we learned that Japan is preparing for a major earthquake. What connections did the video make between earthquakes and volcanoes and mountains forming?

S3. Earthquakes and volcanoes can make mountains.

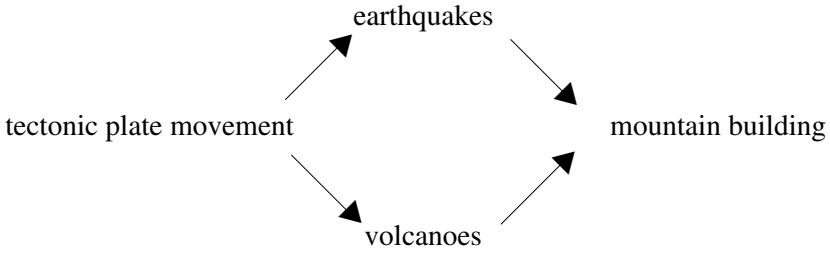
T. Yes.

S4. Earthquakes are caused by bits of the earth moving and crashing into each other.

T. In geography what do we mean by "bits of the earth moving?"

S4. It's the movement of the earth's tectonic plates. Because Japan is located in an area where two plates are colliding, hitting each other, the country experiences earthquakes and volcanoes and these can lead to mountains being formed.

T. Great! We can represent it as a diagram like this. (Teacher draws diagram:)



In this brief transcript we can see that the teacher is scaffolding the students' learning in a number of ways. The teacher:

- makes links with and activates prior learning
- provides a visual model of the students' responses
- models and provides explicit teaching of the subject-specific vocabulary and moves the students from their commonsense understandings of the topic to the technical understandings required by recasting their "spoken-like" responses in more "written-like" language.

Teachers need to provide explicit instruction for students in meeting the literacy demands of their subject areas. This explicit literacy teaching is integral to the content teaching.

This book will provide teachers with the tools to improve their students' literacy achievements. It will also provide a framework for teaching which can be applied to other topic areas.

What is literacy in geography?

Nowadays literacy as a word is used with very broad meanings. We hear people speak of geographic literacy, computer literacy, media literacy. When literacy is used in these ways it is a metaphor for "understanding" and what we really mean is understanding geography, understanding computers or understanding how the media work. This is not what we are talking about here. What we are dealing with in this book is knowing how to go about teaching in a systematic and explicit way so that teaching of the content is not obstructed by students' lack of ability to read and write appropriately in the subject area.

This is how we are defining literacy.

Definition of literacy

> Literacy is the ability to read and use written information and to write appropriately, in a range of contexts. It is used to develop knowledge and understanding, to achieve personal growth and to function effectively in our society. Literacy also includes the recognition of number and basic mathematical signs and symbols within text.
>
> Literacy involves the integration of speaking, listening and critical thinking with reading and writing. Effective literacy is intrinsically purposeful, flexible and dynamic and continues to develop throughout an individual's lifetime.
>
> All Australians need to have effective literacy in English, not only for their personal benefit and welfare but also for Australia to reach its social and economic goals.
>
> *Australia's Language and Literacy Policy*, Companion Volume to Policy Paper, 1991, p.9

To be successful in geography Year 7 students need to demonstrate a variety of literacy skills in order to convey effectively their skills, knowledge and understandings of the content.

Speaking

In studying geography students are expected to speak for these purposes:

- to articulate ideas, knowledge and understandings
- to interact with each other
- to negotiate with others
- to use the technical vocabulary of geography
- to discuss ideas
- to express opinions
- to argue constructively
- to offer explanations
- to ask questions
- to recall information.

This means that, to be successful in speaking, students need to be able to:

- use talk to link prior understandings to new knowledge
- use talk as a preparation for reading
- use talk as a preparation for writing
- choose an appropriate form of speaking according to their purpose
- choose an appropriate language form for the audience
- display an understanding of, and sensitivity to, cultural conventions
- present a strong point of view, including one or two reasoned arguments
- offer explanations for events or phenomena
- use a variety of connectives or conjunctions to express cause and effect and time relationships in a text
- prepare and present a detailed account of a known topic, showing attention to quality of content, organisation and method of presentation
- join in discussions constructively, expressing ideas and opinions, without dominating
- respond to a listener's reaction by restating or modifying content or tone of voice
- use strategies to assist small-group members to contribute, e.g. ask questions to clarify others' viewpoints, negotiate.

Listening

When studying geography students are expected to listen for these purposes:

- to gain information
- to follow instructions
- to respond to a variety of stimuli
- to respond to the ideas and opinions of others
- to understand descriptions and explanations
- to recognise meaning
- to participate in discussions
- to discriminate fact from opinion.

This means that to be successful in listening students need to be able to:

- respond constructively to alternative viewpoints
- ask questions to clarify meanings
- identify the main idea and supporting details of a spoken report and summarise it for others
- make brief notes from a spoken text
- detect strategies that speakers use to influence an audience
- recognise when an opinion is being offered
- recognise the main organisational structures of spoken texts, such as explanations and expositions.

Reading

In studying geography, students are expected to read for the following purposes:

- to locate and select specific information
- to extract and organise information
- to analyse and summarise information
- to relate and link knowledge and understandings
- to make comparisons
- to carry out tasks.

This means that to be successful in reading students need to be able to:

- recognise and discuss varying interpretations of a text, using text details to substantiate these interpretations
- recognise and discuss the ways in which the readers' personal experiences and viewpoints can influence the interpretation of a text
- recognise and discuss the position taken by the writer of the text and the position the writer wishes the reader to take
- recognise important organisational elements in texts, e.g. main ideas and supporting details in factual texts; main argument, supporting points and conclusion in an exposition; general statement or classification and descriptive details in a report
- discuss the ways in which different media treat the same event, e.g. newspaper, magazine, television news
- view a documentary and select information from the text in response to questions given by the teacher
- select, from texts which have been read or viewed, information and ideas needed to complete particular tasks, e.g. writing a description of a place, identifying cause and effect
- predict possible resources and devise a search plan
- identify and locate resources by using a range of strategies, e.g. subject/key word/author/title searches; consulting encyclopaedias, atlases, yearbooks, databases and CD-ROMs in school and local libraries
- use other information sources, such as government departments, local people and organisations, magazines, pamphlets and newspapers
- select resources, using skimming techniques, and scan selected texts to locate information
- find information on an unfamiliar topic in reference sources such as encyclopaedias, reference books, the Internet, CD-ROMs
- select information important to the purpose of reading, e.g. scan a text to locate key information
- use a range of automatic monitoring and self-correcting strategies when reading, e.g. rereading, reading on, slowing down, sub-vocalising
- use word identification strategies, e.g. knowledge of words and their parts, such as root words, prefixes
- attempt several strategies for reading difficult texts, such as talking to others about ideas and information conveyed in the text, rereading or reviewing parts of the text, making notes about key features, consulting the index, contents page or glossary, using diagrams accompanying the text, searching for links with personal experience
- identify layers of meaning within a text, with teacher guidance
- construct considered responses to texts they read or view or have read aloud to them
- justify references about information and ideas implicit in texts by referring to text features and text structure
- consider how different connectives signal time, cause and effect and addition in texts.

Writing

In geography students are expected to write for the following purposes:

- to articulate ideas in written and graphical form
- to classify and describe
- to explain how or why particular phenomena occur
- to present a particular point of view and justify with reasons
- to present varying viewpoints about a topic
- to recount a series of events.

This means that to be successful in writing students need to be able to:

- consider the reader's likely knowledge of a topic and provide an appropriate level of explanation and definition
- choose language appropriate to audience and purpose
- argue a position or point of view, raising a few related points in support of a thesis
- construct an information report that elaborates on and classifies details on a number of aspects of the topic
- construct a media recount with consideration given to headline, visual elements, point of view, chronological order
- discuss in writing some arguments surrounding a topical issue, attempting to relate these one to another
- plan writing through discussion with others and by making notes and lists or drawing diagrams
- record information from a variety of sources before writing
- reread work during writing to maintain sequence and meaning, change words and phrases, or check for errors
- use a variety of drafting techniques (crossing out, cutting and pasting, using carets or arrows to show insertions)
- decide when help is needed with writing and know where to get it (go to a friend for an idea, or to a thesaurus or dictionary for the best word or spelling)
- use a checklist to guide proofreading of their own and others' completed texts
- monitor their own progress as writers and respond to others' writing constructively
- recognise meaningful divisions between sections of text and set these out as paragraphs
- monitor own spelling and attempt corrections through an understanding of word usage, including visual and phonic patterns, word derivations and meanings
- discuss with the teacher and peers how particular aspects of grammar are characteristic of particular text types and attempt to adopt these consistently in own writing

- select vocabulary for its precise meaning and discuss the effect of vocabulary choices in their own writing and that of others
- use a range of conjunctions and connectives to indicate relationships between ideas in writing
- consistently use common punctuation marks correctly
- use legible handwriting style
- use a variety of print and script styles to emphasise or highlight parts of the text (underlined headings, capitals)
- draft text on a word processor
- edit text using cut, copy, paste, move functions.

Chapter 2: The continuum of literacy development

A functional view of language

In the NSW Department of Education and Training, all literacy activities are based on a functional view of language, which emphasises the way language is used to make meaning.

This view of language looks at how language enables people to do things: to share information, to enquire, to express attitudes, to entertain, to argue, to have needs met, to reflect, to construct ideas, to order experience and to make sense of the world. It describes how people use language for real purposes in a variety of social situations. All these language exchanges, whether spoken or written, formal or informal, are called "texts".

A functional view of language takes account of the ways in which the particular language choices we make in any situation influence, and are influenced by, the people involved and the subject matter. The roles and relationships existing between the speaker and the listener or the reader and the writer influence the words used and the ways in which the text will be structured.

Similarly, the subject matter will influence the language choices. For example, in a text about droughts, you would expect to see language which describes and explains, and technical vocabulary about such things as rainfall patterns, land features, such as erosion, and the effects of the drought on people, animals and plants. Statistical information would also be included. In a text about how to construct a triangle you would find language which instructs or commands, such as *mark, draw* and *measure*. Words which name the equipment to be used, such as *compass* and *ruler*, and technical words which relate to mathematical concepts, such as *arc, ray* and *segment,* would also be used.

The language we use has evolved within a culture which has particular beliefs, values, needs and ways of thinking about the world. Our language is shaped by these cultural factors and in turn helps to shape the culture. For example, in the English language we have only one word, *snow,* which describes all different kinds of snow. The Inuit people have ten different words for snow, covering all the different weather conditions. They need to be able to define snow more distinctly because their survival could depend upon the weather conditions that are prevailing.

Primary school experiences

During their primary years students will have been engaged in talking, listening, reading and writing for a range of purposes. These purposes would have led them to become familiar with a variety of different forms of reading, writing, talking and listening. These different forms of language are often called text types. They can be grouped together, based on features they have in common. Primary students will have used a variety of text types in HSIE, such as:

Discussion

A text that argues two or more viewpoints, such as a discussion of the advantages and disadvantages of different land usage patterns.

Explanation

A text that explains how or why something occurs, such as explaining how mountains are formed.

Exposition

A text that persuades by arguing one side of an issue, such as presenting the benefits of eco-tourism in the south Pacific.

Procedure

A text which instructs someone on how to do something, such as giving instructions on how to draw a topographical map.

Recount

A text that retells a series of events, such as a recount of the aftermath of an earthquake.

Report

A text that classifies and describes something, such as presenting information about a feature of the environment.

Students would also have experiences in other KLAs in creating and interpreting other texts such as narratives and responses.

Students' skills in using these text types would have been developed in primary school. Primary teachers tend to use an integrated model of teaching where the boundaries between the various KLAs are not clearly defined.

Secondary school experiences

In Year 7, students are most likely to be asked to listen to and read, view and write narratives in English, dance, drama and history.

In geography students are required to listen to, read and give oral and written explanations and reports. They will participate in oral expositions, discussions, recounts and procedures in all subject areas and also read and write these types of texts in science, geography, English, TAS and PDHPE.

In the early phase of learning, students will be examining these text types as individual entities. In geography, many of the tasks will involve students incorporating the features of several different text types.

Consider a task like this:

Select an issue related to the care of a place and evaluate the different views of people related to the care of that place.

What is this task actually asking of the students?

Students should be shown how to break up the task into its component parts.

1. Select and name a current environmental issue on the care of a place.
2. Gather information, through interviews, newspaper reports, the Internet, etc. about different viewpoints on the use of the place.
3. Examine newspapers and other media to describe positions which individuals and groups hold on the issue.
4. Describe at least two different viewpoints about the changing use of the place.
5. Conclude with a recommendation or general statement about the benefits and risks.

When setting tasks such as this it is important that teachers are clear about the purpose of the task and what they expect the students to produce, and that they explain this clearly to the students. Teachers should ensure that students have been previously supported in presenting information in the ways they are asking and that they explicitly describe the criteria which will be used to evaluate their efforts.

Students' skills in recognising and using the different text types are developed in different ways in primary and secondary years. Primary teachers tend to use an integrated model of teaching where the boundaries between the various KLAs are often blurred. For example, a thematic unit of work in Year 6 on "Space" might incorporate aspects of HSIE, science, technology, English and mathematics. Within this unit students would have been speaking, listening, reading and writing for a number of purposes. They would have produced such texts as information reports, discussions, explanations and narratives.

The implication of this teaching approach is that the students often do not recognise the KLA or the content as separate from the way of reading and writing. Students therefore sometimes have difficulty in transferring their learning from the primary school to the secondary school setting. In order to link with students' prior experiences, secondary teachers need to incorporate explicit literacy instruction into their teaching. For example, students may think that writing explanations is something they do when they write about "Space" and not recognise that it is an appropriate form of writing in many different contexts.

Implications for teachers of geography in Year 7

Teachers need to take account of the prior learning experiences of their students and make links to these experiences for them. This book will provide you with a range of practical ways for addressing the learning needs of students.

In planning explicit support for students to meet the literacy demands of geography in Year 7, teachers also need to recognise that they are preparing their students for the further demands of stages 4, 5 and 6.

When students arrive in Year 7 they have generally already learned a great deal about natural and man-made environments. This learning occurs through activities that have involved them in the processes of investigating and exploring, using a range of technologies and resources.

In high school, the literacy demands of geography will expand and become more sophisticated. Students are expected to interpret and critically examine material and write extended responses and produce effective summaries. These expectations increase as students deal with more complex content in successive stages of schooling. Students need increased literacy skills in successive stages to be able to demonstrate this increased sophistication and complexity of learning.

Students will not easily understand the more sophisticated literacy demands of geography unless teachers explain and explicitly teach these literacy demands. Teachers need to be able to do this using a language to explain how language works in geography.

Supporting students as learners

Students learn about literacy as they interact with peers, teachers and the wider school community in many contexts. Students should have many opportunities to interact with others, to express feelings and opinions and to listen and respond to the views of others. Students should be given opportunities to interact as readers or listeners with a wide range of texts.

In all subjects, students develop understandings and learn new concepts and skills through the use of language. As they explore their environment, investigate problems and participate in cooperative learning activities they use language to clarify their thinking, share and test ideas, communicate with others and reflect on their own learning.

Learning experiences should be designed to involve students in reading, writing, speaking and listening to a variety of texts which relate closely to real-world purposes. Teachers should provide learning experiences that include literacy learning in ways that build on students' real-life experiences and focus on the content students need to learn.

Students should have opportunities to develop confidence in using spoken and written language in a variety of contexts. They should be encouraged to experiment with and explore ways of expressing ideas and communicating meaning as they develop their skills in writing and speaking for a number of purposes and audiences. They should be helped to develop as independent learners as they use language to make their meanings clear.

Students should come to understandings about how language works through frequent talk about the written and spoken texts with which they are working. They should have many opportunities to read, write, talk and listen and focus on the grammatical features that successful texts employ. In this way students will develop a shared language for describing the way language works to achieve particular purposes within geography.

Students need to become actively involved in both naturally occurring and structured demonstrations of language in action within geography.

Learning experiences should provide clear models of successful texts and opportunities for students to create their own texts with support as they move towards independence. Frequent opportunities should be provided for students to participate with their teachers and other learners in the joint construction of texts.

In working towards syllabus outcomes students will often be attempting language tasks which are new to them. These tasks need to be analysed in order to ascertain the specific demands that they will make on students. Once these demands are recognised and understood students should be provided with appropriate support at points of need throughout the process so that they are assisted towards achieving success.

Learning environments need to be structured so that students are encouraged to take risks and understand that approximating is a natural and necessary aspect of real learning. They need to feel that it is acceptable and appropriate to make approximations based on their current level of literacy, while the teacher continues to provide exemplary models and explicitly teaches literacy skills.

The learning activities in geography in which students participate should be designed around real texts. Authentic texts, both spoken and written, form the context to teach learners about how language works and provide a contextual framework for achieving the syllabus outcomes.

In geography, students collect geographic information from a range of secondary sources. Students might need assistance in locating appropriate texts and in selecting those which will achieve their purposes.

We need to teach students how to use the information skills processes of:

- defining
- locating
- selecting
- organising
- presenting
- assessing

and apply these processes to reading, writing and research tasks.

Chapter 3: Assessing, planning and programming for explicit teaching

In order to plan appropriate programs in geography teachers first need to ascertain the skills, knowledge and understandings of their students. This information needs to be considered in relation to the content to be taught and the literacy skills which the students need to enable them to understand the content.

Principles for assessment and reporting in NSW government schools (1996) sets out some useful guidelines for assessing students' achievement and should be read in conjunction with this chapter. It provides advice about assessment within an outcomes approach and the forms of assessment which teachers can use to make judgements about students' achievements and progress. Some assessment strategies which are discussed are:

- collecting work samples and annotating these against a set of criteria
- using self and peer assessment of work against a predetermined set of criteria, and
- assessing performances in activities such as debates, demonstrations and projects.

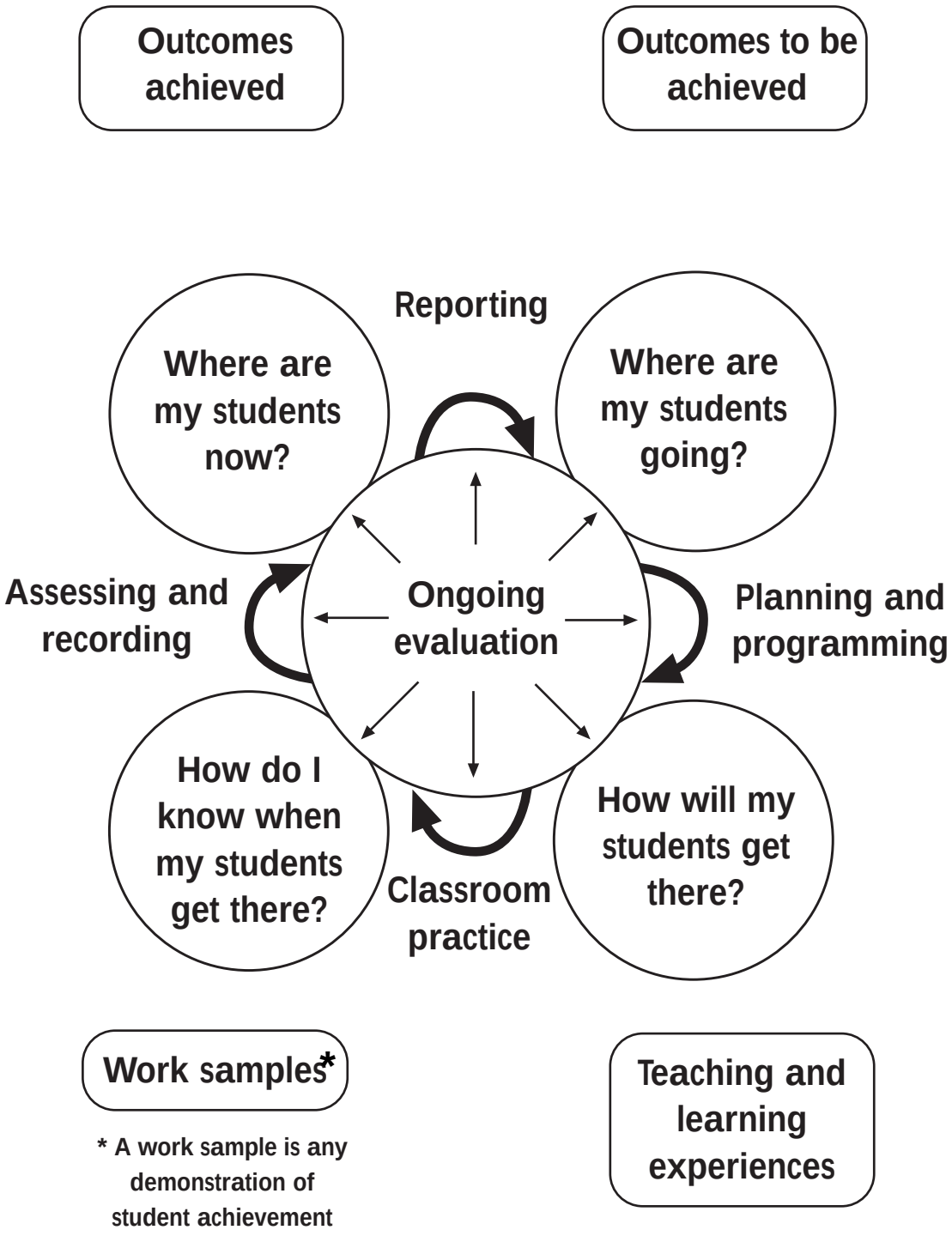
Further information about practical assessment strategies is contained in *Assessing and reporting using staged outcomes, Part 1, Assessing*, NSW Board of Studies (1996).

Uses of assessment

Assessment enables us to evaluate our teaching program and plan further learning. It provides the starting point for planning the learning experiences which will support the content to be taught and the literacy skills to be developed. The information gained will indicate which students might require individual programs or further investigation for learning difficulties. It can provide useful information for other teachers to assist them in planning more appropriately to meet the needs of individuals and groups of students.

Assessment information provides students with feedback about their performance and progress and helps them to set further learning goals. It informs parents and caregivers about student achievement and progress and enables teachers, parents and students to engage in discussion about goals that have been met and make plans for further progress.

The following diagram demonstrates the place of assessment in the teaching and learning cycle.



Where are my students now?

Collecting information about students' literacy achievements

Teachers of Year 7 students should collect information about their students' literacy achievements from a range of sources.

1. Any task in which students are involved is an assessment opportunity. Teachers are constantly making judgments about students' achievements and making decisions about further support, consolidation or acceleration on the basis of what students are demonstrating.
2. Primary schools can provide a wealth of information about students' literacy achievements and experiences. Organise a meeting between the school literacy support team and the Year 6 teachers and possibly the executive of your primary feeder schools to discuss the types of assessment information the primary schools currently collect and what information is most useful for secondary teachers. This could include information relating to students' literacy achievements, learning experiences, performance in all KLAs, attendance records and participation in support programs.

   The school literacy teams could develop ways of passing on the information. Some possible ways include: student profiles where the criteria have been jointly negotiated, with annotated work samples (again with agreed criteria); personal interviews between the Year 6 teacher and the Year 7 coordinator; or discussions between the school counsellors of the two schools.
3. The ELLA results will provide information about students' skills in reading, language and writing at an individual level and in comparison with the cohort and indicate students in need of additional support. ELLA results will provide a starting point for planning and programming appropriate teaching and learning experiences.
4. Support teachers within the school can provide information about students.

ESL teachers can provide advice about students' levels of achievement using the ESL scales and the implications of this for the teaching program. The ESL scales support teachers in making judgments about ESL students' achievements and language learning needs.

The ESL scales are a supplement to syllabus documents, and to any curriculum support material, such as teaching units. The ESL scales enable teachers to recognise and articulate the progress their ESL students make as they develop their proficiency in English. The ESL scales are to be used in conjunction with mainstream curriculum documents.

It is also important that we use a tool such as the ESL scales to ensure that the second language learners are not incorrectly diagnosed as "failed literacy learners". Second language acquisition issues might be diagnosed as learning difficulties which might result in inappropriate or misdirected support.

Support teachers learning difficulties (STLDs) can provide advice about alternative or additional teaching strategies to assist those students who are experiencing difficulties. They are able to diagnose particular learning difficulties and suggest programs and procedures for addressing these particular needs.

Formal assessement tasks are only one way of making decisions about students' progress. Much assessment takes place informally in the classroom. Informal assessment strategies can provide valuable information.

There are many ways in which we can collect informal information about students' literacy progress. These include:

- observing students at work. For example, are students able to select appropriate resources for a research topic? Can students follow a set of oral instructions?
- generating anecdotal evidence, such as talking to students and other teachers, or observing and listening as students talk to each other. Is there a specific purpose evident in their talk? For example, can they ask appropriate questions or provide information?
- observing students completing class activities when outside the classroom, such as in the library or undertaking field work.
- analysing work samples, such as written work or oral presentations.

Where are my students going?

When we select learning outcomes for a unit, we are identifying what it is the student should be able to do at the completion of the unit. To select appropriate outcomes, we need to have some information about the skills which the students demonstrate before we teach the unit. This will enable us to select suitable teaching and learning strategies and to determine the appropriate content.

What information needs to be collected?

1. Information needs to be collected about students' current knowledge, skills and understandings of the content which the geography syllabus outlines. Conducting quizzes, making "What we already know" charts or having students construct a model will provide information about appropriate starting points.
2. Information also needs to be collected about students' literacy skills which will influence their ability to demonstrate proficiency in the new content. Consider what the literacy demands of the planned work will be. Determine whether students have previously encountered these sorts of demands.

It might be necessary to have students provide a piece of writing, or participate in an oral discussion, or have them read a piece of text to determine what level of support will be required. Think about the technical or subject-specific language which students will be required to use and ways in which they will need to be supported. Examine the texts they will be required to read to determine whether they will be too difficult or too simple for some students. It may be necessary to find a range of texts to suit the differing achievement levels of the students. Consider what forms of support students will require as they read the texts.

How are my students going to get there?

To achieve geography outcomes and improve the literacy skills of students, we need to be explicit and systematic in our approach.

Explicit teaching involves:

- explaining to students the purpose of the task or unit of work
- presenting tasks clearly
- modelling and demonstrating the tasks to be performed
- making links with prior knowledge
- selecting appropriate tasks and texts
- providing positive and useful feedback to students on both their developing content knowledge and skills and their literacy skills
- correcting errors and providing further modelling and demonstration as needed
- providing links between content and strategies
- providing opportunities for students to practise new skills and understandings with guidance from the teacher or support from peers
- providing challenging tasks which allow students to progress and refine their skills, knowledge and understandings.

Systematic teaching involves:

- having a clear understanding of the skills, knowledge and understandings that need to be taught
- breaking the learning up into meaningful "chunks"
- knowing what literacy demands are inherent in the content to be taught
- knowing a range of appropriate strategies for teaching literacy
- monitoring students' progress consistently throughout the teaching and learning cycle and adapting the teaching where necessary
- giving students opportunities for observation, guided practice and independent performance of all new learning.

(adapted from: NSW Department of Education and Training, *Focus on literacy* (1997).

Students can be supported in reading more difficult texts by using strategies such as:

- highlighting new vocabulary and teaching it beforehand
- using headings and subheadings to predict what a text will be about
- considering the theme of a text to predict what the contents might be.

In some cases audio tapes may be made of a text and a student may follow the text at a listening post.

How do I know when my students get there?

We use a variey of assessement strategies to make judgements about whether or not students demonstrate achievement of learning outcomes. Assessment is integral to the teaching and learning process as it provides us with valuable information that can be used to improve the quality of our work. Assessment information can be recorded in a variety of ways, depending upon the intended audience for the information. The evidence of achievement of geography outcomes is the demonstration of what a student knows and can do. To achieve geography outcomes, students will also be demonstrating a range of literacy skills.

The following unit of work will exemplify a range of strategies for explicitly teaching literacy in geography.

Chapter 4: Unit of work

Earthquakes

Text type focus: explanation and descriptive report

Introduction

Rationale

This unit of work focuses on reading, viewing and writing about the causes and effects of earthquakes. Case studies of the Newcastle and Los Angeles earthquakes are developed. The unit begins by building students' field knowledge of the structure of the earth.

The unit highlights:

- using maps to read, record and interpret geographical relationships
- learning how to interpret single and multi-feature maps
- locating information in tables and written text and transferring this information to maps
- using technology to locate and analyse information
- reading and writing texts that describe and explain
- developing technical language.

Explicitly recognising and identifying structures and language features will assist students to understand and respond appropriately when listening to or reading explanations and descriptive reports and will help them to write successful explanations and descriptive reports.

This approach will support effective learning arising from the investigation of the causes and effects of earthquakes on the landforms and people of Newcastle and Los Angeles.

Using the unit in Year 7

This unit has been designed to address the focus areas of "Investigating the world" and "Global environments". This topic of earthquakes draws on content in these focus areas:

- the nature of geography
- characteristics and distribution of environments
- geomorphological processes contributing to diverse global physical environments, and
- types of human communities.

This is approached as a study of the interaction between the physical environment and a related human community. Two case studies will be explored, Newcastle and Los Angeles.

Stage 4 Global geography outcomes

A student:

- identifies and gathers geographical information
- organises and interprets geographical information
- uses a range of written, oral and graphic forms to communicate geographical information
- demonstrates a sense of place about environments outside Australia
- describes the geographical processes that form and transform environments
- identifies and discusses geographical issues from a range of perspectives
- describes the interrelationships between people and environments
- describes differences in the opportunities throughout the world in terms of social, cultural, economic and physical environments
- explains how geographical knowledge, understanding and skills contribute to active and informed citizenship.

Resources

Teacher reference

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Overview

Earthquakes				Text types: Explanation (sequential-causal), descriptive report	
Curriculum phase	**Learning activity**	**Language emphasis**	**Resources**	**Learning indicators** Students can:	**Assessment suggestions**
Opening the field	Activity 1: Finding information from news stories.	• predicting • locating specific information • introduction to the structure of news stories	BLM 1 BLM 2	• recall information about earthquakes • predict subsequent text • use appropriate terms to identify parts of a newspaper	• Teacher observation
Determining prior knowledge	Activity 2: Mind mapping information about earthquakes.	• vocabulary – especially technical terms	BLM 3 BLM 4	• recall/predict causes of earthquakes and effects on both human and non-human environments	• Teacher observation • Completed mind maps
Building field knowledge and modelling	Activity 3: Students are introduced to the structure of the earth orally and diagrammatically. Students are supported in reading the text and defining technical words. Students consolidate information by completing a cloze report.	• introduction to technical terms • listening for information • reading for detail • reading to locate and define technical terms • transferring information from a visual image to a text	*Encarta* BLM 5 BLM 6	• use technical terms appropriately • locate parts of the earth • locate specific information • transfer information from visual mode • recall and describe structure of the earth	• Teacher observation • Cloze task
	Activity 4: Structure and language features of descriptive reports.	• structure of definitions • technical vocabulary	BLM 7 BLM 8	• recognise and locate organisational and language features of descriptive reports	• Teacher observation
	Activities 5 and 6: Labelling diagrams of earth	• reading to locate specific information • using technical language	BLM 9 BLM 10	• correctly label digrams	• Completed worksheets
	Activity 7: Jigsaw map of the world which shows the location of the main lithospheric plates.	• predicting • reading visual texts	BLM 11a BLM 11b	• complete the map • predict countries or areas most likely to experience earthquake activity	• Completed maps • Teacher observation
	Activity 8: Researching earthquakes this century	• information process skills • reading visual and multi-media texts • selecting resources • locating information	Internet sites Videos CD-ROMs World map	• select appropriate resources • locate information from a range of sources, including Internet and video	• Completed table of information

Earthquakes				Text types: Explanation (sequential-causal), descriptive report	
Curriculum phase	**Learning activity**	**Language emphasis**	**Resources**	**Learning indicators** Students can:	**Assessment suggestions**
Modelling and building field knowledge	Activity 9: Teacher explains sequence of events leading to an earthquake.	• listening for specific information • establishing a sequence of events as a basis for an explanation	*Encarta* BLM 12	• orally explain the sequence of events leading to an earthquake	• Teacher observation of students' oral explanation
	Activity 10: Teacher demonstrates the sentence patterns of explanations. Students re-assemble a jumbled text.	• sentence patterns which build a sequence • technical vocabulary	BLM 13 BLM 14, BLM 14a	• use knowledge of typical sentence patterns of explanations to reconstruct a text	• Teacher observation of students' oral explanation
Modelling and deconstruction	Activity 11: Structure and language features of a causal explanation	• abstract nouns • verbs in simple present tense • words which demonstrate cause and effect • words which denote a time sequence	BLM 12 BLM 15	• identify organisational and language features of a causal explanation	
Joint construction	Activity 12: Students match cause and effect statements. Students learn about ways of expressing cause in texts.	• ways of expressing cause and effect	BLM 12 BLM 15a BLM 15b BLM 16 BLM 17	• relate cause and effect statements • identify words/word sequences which express cause • recall the sequences of cause and effect which result in earthquakes in a transform fault zone	• Successful completion of matching task
	Activity 13: Case study 1:- Newcastle. Students examine causes and effects of Newcastle earthquake. Students jointly construct explanation of how intraplate earthquakes occur. Extension task: Students investigate other earthquakes in Australia.	• writing a causal explanation • research skills	BLM 12 Internet	• recall causes of intraplate earthquakes • contribute to joint construction of an explanation • use appropriate technical language	• Teacher observation

Earthquakes				Text types: Explanation (sequential-causal), descriptive report	
Curriculum phase	**Learning activity**	**Language emphasis**	**Resources**	**Learning indicators** Students can:	**Assessment suggestions**
Building field knowledge and joint construction	Activity 14: Students research aspects of Newcastle to contribute to a jointly constructed descriptive report.	• research skills • reading to locate information • reading for detail • note taking • identifying main ideas • technical vocabulary • structure and language features of a descriptive report	Internet maps of Newcastle, newspaper articles, books about Newcastle, BLM 7 BLM 8	• locate appropriate information • use a graphic outline to take notes • contribute to group construction of a section of a text • contribute to construction of a complete text • justify reasons for including or excluding information	• Evaluation of students' notes • Students' contributions to written texts
	Activity 15: Reading a newspaper article, "Newcastle earthquake", to identify main ideas.	• locating specific details • identifying main ideas and supporting information	BLM 18	• identify main ideas in a text • locate specific details	• Teacher observation
Independent construction	Activity 16: Writing a summary. Students independently write a summary of key information relating to the Newcastle earthquake.	• key words and phrases which indicate main ideas • using subheadings to organise information • writing a complete text from notes • critical literacy • reading to generate another text	BLM 18 Australian newspapers from Dec. 28 or 29, 1989	• locate key information in a text • write a summary	• Students' responses
Building field knowledge and joint construction	Activity 17: Mind mapping. Students explore the concept of a community.	• categorising ideas • linking ideas • recalling information	*Geography matters* felt pens A3 paper	• understand what is meant by the term "community" • categorise and link information	• Teacher observation of students' contributions
	Activity 18: Reading and interpreting an isoseismal map.	• map reading • locating specific information • technical vocabulary	Isoseismal map of Newcastle earthquake area	• locate specific features on a map • describe magnitude and affects of earthquake	• Teacher observation of students' contributions to discussion

Earthquakes				Text types: Explanation (sequential-causal), descriptive report	
Curriculum phase	**Learning activity**	**Language emphasis**	**Resources**	**Learning indicators** Students can:	**Assessment suggestions**
Building field knowledge and joint construction	Activity 19: Interpreting photographs. Students develop skills in interpreting geographic information from photographs. Students record their observations and interpretations.	• technical language relating to photography • reading visual texts to create a new text • critical literacy	Internet photographs BLM 19 BLM 1	• extract geographic information from visual texts • use appropriate vocabulary to describe photographs • identify possible reasons for choices made by the photographer	• Students' ability to interpret and gain information from photographs
	Activity 20: Students examine the socio-economic impact of the earthquake by reading a number of reports. Students work in small groups to write a structured summary of the effects of the earthquake.	• reading to generate another text • identifying key ideas • summarising information	BLM 20a, 20b, 20c, 20d BLM 21 BLM 22 BLM 23	• locate specific information • record information in note form	• Completed note-taking grids • Group reports
	Activity 21: Case study 2: Northridge, Los Angeles. Students locate places on a map and plot earthquake sites on a map.	• map reading • locating and interpreting information from a table • language of location	Map of Pacific Rim countries BLM 24	• describe location of places using appropriate terminology • plot places on a map using longitude and latitude	• Teacher observation
	Activity 22: Students learn about the physical features and human activities associated with Los Angeles. Students complete a cloze task.	• adjectives which classify and describe • using headings to predict content in a text	BLM 25 map of west coast of USA	• use adjectives which locate places • predict information • confirm or alter predictions	• Cloze task
Independent construction	Activity 23: Students write a descriptive report about Los Angeles.	• structure and language features of a descriptive report	Internet sites BLM 26	• locate specific information • organise information appropriately	• Assessment criteria (BLM 26) for descriptive report

Earthquakes				Text types: Explanation (sequential-causal), descriptive report	
Curriculum phase	**Learning activity**	**Language emphasis**	**Resources**	**Learning indicators** Students can:	**Assessment suggestions**
Building field knowledge and modelling	Activity 24: Reading for information. Students read texts with support to understand why Los Angeles experiences so many earthquakes.	• using "before, during, after" reading strategy • reading to locate specific information	BLM 27	• answer given questions • explain why southern California experiences so many earthquakes	• Students' responses to questions
	Activity 25: Students use the Internet to locate information about faults within the Los Angeles area.	• locating information from multimedia texts • recording information in table form	Internet sites BLM 28 BLM 29a, BLM 29b	• locate Internet sites • interpret information from a variety of sources and forms • record information in a table	• Completed tables • Teacher observation of students' ability to locate Internet addresses
	Activity 26: Reading to identify main ideas. Students read a newspaper article and a geological report to extract specific information and construct a map.	• reading to locate information • reading to generate another text • technical language and acronyms • developing a key for a map	BLM 30 BLM 31	• locate specific information • describe consequences of the earthquake • construct a map showing extent and magnitude of earthquake	• Students' responses to given questions and map
Joint construction	Activity 27: Collecting information from photographs.	• reading visual text • locating geographic information from photographs • critical literacy	Internet sites, photographs	• describe natural and human features portrayed in photographs • describe extent of damage • hypothesise about causes and effects • provide possible reasons for choices made by photographer	• Teacher analysis of groups' oral reports

Earthquakes				Text types: Explanation (sequential-causal), descriptive report	
Curriculum phase	**Learning activity**	**Language emphasis**	**Resources**	**Learning indicators** Students can:	**Assessment suggestions**
Independent construction	Activity 28: Students read a series of articles to extract and record information about the Northridge earthquake.	• reading to get the gist of a text • reading to locate specific information • reading to generate another text • note-taking • identifying main ideas • technical vocabulary	BLM 32 BLM 33 BLM 34 BLM 35 BLM 36 BLM 37 BLM 38 BLM 39 BLM 40 BLM 41	• locate information to complete note-taking grid • identify main ideas	• Assessment criteria provided

Introduction

If this is the first unit of work taught in geography in Year 7, it would be advisable to begin by establishing an understanding of the field of study that is geography. The emphasis of this unit is on the interaction between a physical environment and a human community. The time spent building the field, to establish an understanding of the structure of the earth and the causes of earthquakes, will depend when this unit is taught within the Stage 4 geography program. Consideration also needs to be given to where it fits in relation to the Stage 4 science program.

Phase : Opening the field

In this phase students are introduced to the subject or field they are about to study. Where possible the field is opened in a way which is non-technical, relating to their everyday experiences.

Explain to students that in this unit of work they will be focussing on answering the following questions which concern geographers.

1. What is there?
2. Where is it happening?
3. Why is it there?
4. What are the consequences?
5. Should it be like this?
6. How is it changing over time? What are the reasons for the changes that have occurred to this area over time?
7. What are the solutions to this?

In the following activity the field is introduced using a newspaper. As teachers subsequently move into the building field knowledge phase they move students from their everyday understandings and language to technical geographical understandings and language. Activity 1 provides an opportunity for students to develop their reading skills by predicting what will follow and locating specific information.

Activity 1: Finding Information from news stories

Purpose:

- to introduce the field
- to develop skills in prediction
- to develop skills in locating information
- to develop an understanding of the structure of the news story
- to encourage non-threatening group interaction and
- to share group knowledge.

Predicting meaning

Show students photographs of the Newcastle earthquake. (BLM 1)

Provide the following questions for small-group discussion;

(a) What do you think has happened?

(b) Where do you think this event occurred?

(c) When do you think it happened? (time of day? season? year?)

(d) Why do you think it happened?

(e) Should it be like this?

(f) What are the effects or consequences this event has had on

- people?
- the natural environment?
- the built environment?

Reading to locate and survey reading

Students will predominantly survey read and read to locate specific information to complete the next part of this activity.

> When students survey read, they read to get the gist of the text, including an idea of how it is organised. This orients readers to the text, giving them general information about the topic and enabling them to choose to read further. When surveying a particular text, successful readers look firstly at the title, pictures or diagrams, then the first paragraph and the first sentences of successive paragraphs (known as previews).
>
> When students read to locate they are searching for specific information. In this task students will be locating the answers to the questions asked. To assist in this type of reading, they will draw on their understanding of language and their understanding of the structure of the newspaper article, their ability to skim (read for the main idea) and scan (look for key words or numbers).

Show students the headline and lead paragraphs from the newspaper extract. (BLM 2.)

Ask students to read through the newspaper extract and expand upon their answers to the previous questions.

Finding information in newspapers

Point out that pictures, headlines and lead paragraphs in newspapers usually contain information about the what, where and when, and in the case of natural disasters, the effects of what has happened.

If we want to find out more information about why these events occurred, we usually have to read further into the article or even wait a few days for the explanation to be written.

Activity 1 continued…

The structure of a typical news story

Tell the students that news stories have a typical three-part structure.

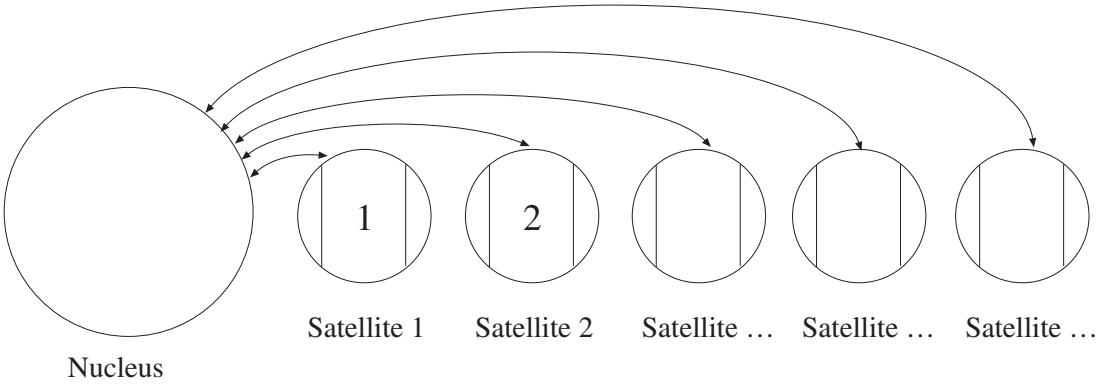
(a) They usually have a headline which previews what will follow. The headline in some stories contains emotive words (words which evoke positive or negative feelings) e.g. *disaster, shatters, mass destruction*. Ask the students why emotive language is used. Possible answers might include: to make the story sound exciting, to encourage people to have a personal response, to create interest and to purchase the paper. Ask students to identify any emotive words which were used in the extract from the news article.

(b) Then follows a section known as the lead which synthesises what the story is about, giving more detail than the headline but much less detail than the rest of the story.

(c) The remainder of the news story provides sections of more detailed information. Each section is usually written discretely so that it can be moved around within the article or cut from the story completely to reduce the size and provide space for another article.

The structure of a news story can be described as a nucleus (lead) and satellites (sections of detailed information) structure. The satellites do not usually build upon one another, but build on the lead, so they can be moved around or deleted by the editor. The diagram below demonstrates this structure.

Demonstrate this structure to students using some newspaper articles from the resource list.



Phase: Determining prior knowledge

Activity 2: Mind mapping information about earthquakes

Purpose:

- to share prior knowledge
- to reassess the shared information with the group
- to display these understandings by building a mind map
- to encourage group interaction, and
- to share group knowledge.

Tell students that in this activity they will be able to discuss any ideas they already have about earthquakes.

Demonstrate for students the construction of a mind map. BLM 3 can be used as an example.

Accept several responses from the group to ensure students understand the task. Encourage them to suggest both everyday ideas (ones which are non-technical and may not have a geographic basis) and technical ideas. Remind them that their answers do not have to be in complete sentences and that they can add more circles to the map as needed.

Point out that this activity is a starting point for the thinking and writing activities which will follow.

Tell students that they may use the questions from activity 1 to organise the information on their mind maps.

Make additional copies of BLM 3 so that students can complete individual mind maps.

Allow three to four minutes for students to complete this task.

This individual work will be used to help students contribute to the next task. Later it can be pasted into their notebooks as a record for you to examine and for them to modify during the unit. It is a useful end of unit reflection point for students to assess how much their understandings have changed.

- Students form groups of three or four to discuss understandings, share and modify their ideas for key words and phrases on the mind map and brainstorm more ideas about earthquakes.

Supply each group with an overhead transparency and marker pens, or an A3-size copy of BLM 3.

- Each group constructs a mind map by writing ideas on the BLM.

Students display and describe their mind maps and compare them with those from other groups in the class.

- Discuss ways in which different cultures in the past have attempted to explain the nature and causes of earthquakes.

A map of the world giving summaries of some earthquake legends is included as BLM 4.

Activity 2 continued…

Vocabulary building

Ask students to suggest what the word "earthquake" means.

Explain that it is a compound word, made up of the words, *earth* and *quake*, and that the meaning can be found by defining the separate parts of the word.

Earth means "the planet on which people live".

Quake means "to shake".

Ask students to use this information to construct a definition. They can then use a dictionary to compare their definitions with that of the dictionary.

Ask students to add the word to their vocabulary list.

Assessment:

Refer to the individual and group mind maps to determine students' prior learning about earthquakes and to evaluate the teaching and learning sequence which has been planned. Remember that this is also an opportunity to evaluate the students' use of technical language related to the study of earthquakes in geography. Students' verbal explanations of what causes an earthquake will also provide some indication of their understanding of how an explanation is constructed.

Phase: Building field knowledge and modelling

In this phase students begin to develop technical understandings about earthquakes. The mind mapping activity established which understandings students have previously developed. These activities move students from their everyday understandings to more technical and geographical understandings and provide an opportunity for students to revise and clarify their thinking. The level of support you provide for these activities will depend on students' familiarity with the topic. Activity 3 includes an oral description and listening and reading activities for students.

The modelling phase is an important opportunity for the teacher to apprentice students into the language of geography. The phase is initially teacher-centred then becomes focussed on group work. The role of the teacher as expert is important because it is in this way that the appropriate geographic language patterns are made explicit for the students.

Activity 3 : Cloze exercise

Purpose:

- To introduce the students in an oral and visual mode to the structure of the earth: the core, mantle, crust, oceanic crust, and continental crust.
- To introduce students to the structure and language features of descriptive reports.

Distribute BLM 5 *Structure of the Earth,* which is a descriptive report. Ask students to look and listen for the words which are missing as they use the information sources. The words they must locate are all things. That is, they are all nouns or noun phrases, with adjectives which describe and classify the nouns.

Once the report is completed discuss the solutions.

Read the text again with the students and talk out the text, that is read and rephrase the text orally and ask students to do the same.

Explain that the text which students have just completed is often referred to as a descriptive report.

Students use a resource such as *Encarta 1996,* which has an animated sequence which first describes the structure of the upper part of the earth and then explains why the plates move.

Students complete the cloze on BLM 5 using information they have gained from *Encarta*. The cloze can be completed by using the menu bar to listen only to the first few frames of the animation. Students can locate the appropriate information by searching for the words "plate tectonics" using the "find" option.

Using appropriate visual support, orally describe the structure of the earth. The completed text on BLM 6 can be used as a guide.

Teacher talk is a valuable opportunity to introduce students to the technical terms which will be used in the text, images and sound in the remaining part of the activity.

Activity 3 continued…

- Explain that many of the terms used in geography are different from the words we use in everyday language, e.g. *mantle*.
- Explain that these words are called technical terms. They are necessary to give precise meanings and are often found within definitions, e.g. *The mantle is the thick layer between the crust and the core of the earth.*
- In order to answer the geographic question "What is it?" we often need to make definitions of technical terms.
- Explain that definitions contain a relating verb which links the term with the meaning (usually *is*, *are*, *is known as*, *is referred to as*, *means*, *indicates*). It functions as "=" in definitions.
- Ask students to locate examples of definitions in the text they have just completed.

Activity 4

Purpose:

- to introduce students to the organisation and language features of a descriptive report.

Make an overhead transparency of the report, *Structure of the earth* (BLMs 7 and 8), to highlight for students the purpose, structure and language features of descriptive reports and their usefulness in geography.

Focus text: Descriptive report

Purpose:

In geography descriptive reports are used to provide information about a topic.

Descriptive reports are usually organised in the following way:

1. General statement

This section of the text will identify the thing being described, locate it in time and space if necesary, and preview the information which will follow.

2. Description

This section of the text sets out the information in the report. Typically, it will consist of a number of paragraphs, each of which deals with a different aspect of the description.

Each paragraph usually contains a sentence which previews the information in the rest of the paragraph. This sentence can be called a topic sentence or paragraph preview.

Sometimes there is a sentence which has the function of previewing a section of text, which may include a number of paragraphs. This sentence is known as a section preview.

Previews are often used in successful reports in geography. A preview gives an idea of what the rest of the information will be about. Previews can be used at different levels. The example has a text preview in the general statement (previewing the whole text) and section previews (previewing each different descriptive section in the description stage of the report). These are identified in BLM 7. Successful readers use previews to decide if sections are relevant before they read them.

Sentences in geographical reports usually begin with the thing being described. This pattern can be seen in this report, e.g. sentences in the section on the crust often have the word "crust" at the beginning of the sentence. A successful reader can locate things being described by reading the beginnings of sentences.

Language features of reports:

Use technical language, e.g. *mantle*.

The things being described are usually placed at the beginning of the sentence.

Verbs are in the present tense. BLM 8 shows the language features of a descriptive report.

Students will use the information from the report they have just completed to construct a table of technical words and their meanings. Students may add to this list during the unit.

Technical word	Meaning
crust	outermost layer of the earth
continental crust	the crust which forms the continents
oceanic crust	the crust which is covered by oceans
mantle	a thick layer of rock beneath the crust
core	the layer in the centre of the earth
sphere	a solid, round shape
plates	areas of the earth's crust, usually bounded by ocean ridges or deep trenches
lithospheric plate	a mass of solid rock which is made up of crust and mantle

Activity 5: Labelling a diagram of the earth

Provide students with the diagram of the structure of the earth on BLM 9 and have students use the information from the descriptive report to label it.

Activity 6: Lithospheric plates (cross-section)

Purpose:

- To develop the concept that the lithospheric plates "float" on a sea of magma so that students will understand that the plates move and that, as they move, they come into contact with other plates. The result of the movement is an earthquake.

Provide students with a copy of BLM 10 showing the enlarged cross-section of the structure of the earth. Use the diagram to explain that these oceanic and continental plates make up the earth.

Explain that the asthenosphere is located beneath the lithosphere. Demonstrate its location on the diagram. Assist students to label the diagram using the appropriate terms.

Tell students that they will now investigate what causes earthquakes by further examining the lithospheric plates.

Activity 7: Lithospheric plates (map)

Purpose:

To develop an understanding of continental and oceanic plates.

1. Jigsaw task: Give students a map of the world which shows the main lithospheric plates but which has been cut into pieces (BLM 11a). Ask students to work in groups to re-assemble the pieces. BLM 11b provides the solution.
2. Assist students to identify particular countries where the continental plates meet or collide. Ask the students to predict where they think earthquakes are likely to occur.
3. Students should use atlases to confirm their predictions.

Explain that the term *continental region* is used in geography to refer to those parts of the lithospheric plate which are above and below the low tide mark. These continental regions may include more than one country. One example is South America.

(N.B. Ensure that students understand the concept of a *low tide mark.*)

Ask students to predict which continental regions might be more likely than others to experience earthquakes. Students should record their predictions so that they can revisit and confirm or modify them at the end of the unit.

Activity 8: : Researching earthquakes this century

Purpose:

This activity will develop field knowledge about the location and intensity of earthquakes. Students will also be introduced to research skills using library resources including CD-ROMs and the Internet.

Suggested resources for research

- **www.ngdc.noaa.gov/seg/hazard/sig_search.htmp/#dthct** (significant earthquake database search)
- **www.neic.cr.usgs.gov/current_seismicityshtml** (National earthquake information centre)
- ABC Education Television (1998). Hazards, disasters and survival series, No. 5, *Earthquakes and landslides.*

Setting the context

- Explain to students that they will be working with a partner to research the location and intensity of earthquakes this century.
- Give students a proforma on which they will record their findings.

Sample proforma:

Year	Location	Death toll

Modelling research skills

Work with the teacher-librarian to introduce students to research skills and to locate suitable resources, including using CD-ROMs and the Internet.

Activity 8 continued…

The information process

Steps in the process	Information skills
Defining What do I really want to find out? What is my purpose? Why do I need to find this out? What are the key words and ideas of the task? What do I need to know?	Students should be able to: • relate the task to their learning • clarify the meanings of the words of the task • identify and interpret key words and ideas in the task • state the task in their own words • work out the parts of the task
Locating Where can I find the information I need? What do I already know? What do I still need to find out? What sources and equipment can I use?	Students should be able to: • recall relevant information and skills from previous experience • recognise strengths and limitations of current knowledge and decide whether additional information or skills are needed • limit an investigation to a manageable size • identify possible sources (people, organisations, places, print, non-print materials, objects) • recognise the relative worth of sources • select the best of these sources to use • locate sources and appropriate equipment • use appropriate equipment • record details of sources that are used
Selecting What information do I really need to use? How relevant is the information I have found? How credible is the information I have found? How will I record the information I need?	Students should be able to: • begin to assess the usefulness of each source • use key words to locate potentially useful information within sources • skim each source for information • identify information that has links with the task • assess and respect privacy and ownership of information • decide what to do about deficiencies within information • assess the credibility of sources which express opinion • identify inconsistency and bias in sources • devise a system for recording their own information • summarise information • record quotations and sources of information
Organising How can I best use this information? Have I enough information for my purpose? Do I need to use all this information? How can I best combine information from different sources?	Students should be able to: • review the purpose of the task • combine the information into larger units of information • combine the units of information into a structure • review the structure in light of the purpose of the task • adjust the structure where necessary
Presenting How can I present this information? What will I do with this information? With whom will I share this information?	Students should be able to: • identify the requirements of different forms of presentation • consider the nature of the audience for presentation • select a form and style of presentation appropriate to the audience and the content of the material • prepare the presentation • present the information
Assessing What did I learn from this? Did I fulfil my purpose? How did I go – with each step of the information process? How did I go – presenting the information? Where do I go from here?	Students should be able to: • review the extent to which the end product meets the requirements of the task • assess their use of this process in completing the task • examine the strengths and weaknesses in specific information skills • identify increases in knowledge • set personal goals for the further development of information skills

Assist students to locate information about places where earthquakes have occurred during this century.

Ask students to provide five examples of countries where earthquakes have occurred, including the year and an indication of its impact.

Students should locate their examples on the map of the world which they used in the previous activity.

Sample completed task

World's worst earthquakes		
Year	**Location**	**Death toll**
1906	San Francisco, USA	1 000
1923	Tokyo, Japan	100 000
1970	Yungay, Peru	70 000
1976	Guatemala City, Guatemala	10 000
1976	Tangshan, China	240 000
1978	Turkey	4 000
1985	Mexico City, Mexico	1 500
1990	Iran	56 000

Source: *Weekend Australian,* 10 -11 December, 1988

Phase: Modelling explanations and building field knowledge

Activity 9: Oral explanation of plate movement

Purpose:

To explain why earthquakes occur as a result of two plates horizontally moving past each other.
The locations where these movements occur are technically known as transform fault boundaries. In this activity we refer to them as transform fault zones. The San Andreas fault zone is an example of this type of fault on a continental crust. Los Angeles is located in this fault zone.

This activity will draw on the students' understanding of the structure of the Earth (established in Activity 3). It is important that this oral stage is completed so that the information is first presented in an oral manner before students are expected to work with a written text. The oral work and associated diagrams provide a good opportunity to establish the concept that a sequence of events is the basis of an explanation. This concept can be developed by clearly explaining one event at a time.

Provide students with a copy of BLM 12, *Explanation of why earthquakes occur at transform fault zones*. Make an overhead transparency of BLM 12, and use it in conjunction with a suitable diagram to explain why earthquakes occur at transform fault zones. Your oral explanation should reflect the events shown below and in the explanation.

Sequence of events

1. Currents are created in the asthenosphere (core and mantle).
2. Currents slowly drag lithospheric plates horizontally past each other.
3. Crustal material on the moving plates is subject to considerable pressure.
4. Zig-zag cracks develop in the crust.
5. Parts of the crust on either side of the cracks become locked.

An earthquake occurs when the locked crust finally moves.

To further consolidate their understandings, students listen to and look at a multimedia source, such as the animated sequence on plate tectonics found on the CD-ROM *Encarta*.

> The use of the CD-ROM provides a good opportunity to reinforce the oral explanation you have provided. Completing the oral explanation before the students use *Encarta* will assist the students to achieve reading success on the CD-ROM.

Assessment

Ask the students to recall orally the sequence of events. Their responses and degree of involvement in explaining the sequence will indicate their preparedness to move on to the next activity.

Explain to students that there are two different types of earthquakes which can occur. They have been investigating the type known as a transform fault earthquake. Another type of earthquake is known as an intraplate earthquake.

1. Transform fault earthquakes occur at the plate boundaries or margins. They are the result of two plates horizontally moving past one another. The locations where this movement occurs are known as transform fault zones. The San Andreas fault in California is an example of this type of fault on a continental plate. Los Angeles is in this fault zone.

2. Intraplate earthquakes do not occur in well defined patterns like those at plate boundaries. Intraplate earthquakes are caused by pressures or stresses in the crust at depths of up to 50 kilometres. They can be related to stresses caused at the plate boundaries and temperature changes in the crust caused by currents deep within the earth. It is currently difficult to predict their location, size or timing. Newcastle was an example of an intraplate earthquake.

Stress builds up in the rocks both at plate boundaries and within the continental or oceanic plate itself, because of the continual movement of these plates. When the rocks fracture, the whole plate boundary doesn't move or slip at the one time. Instead, stress is released as sections of the plate move at different times. By monitoring faults, scientists have discovered that the most likely place for an earthquake to occur is at a section of a fault which has remained stationary for the longest period. Seismologists call these sections "seismic gaps".

Activity 10: Using text patterns and field knowledge to unjumble text

Purpose:

To introduce students to the sentence patterns of explanations.

In this activity students are given jumbled pieces of text. To reconstruct the text the students will rely heavily on a particular sentence pattern found in explanations. The pattern is that the information introduced at the end of one sentence is often used as the starting point for the next sentence.

Demonstrate this pattern to students.

The following sentences demonstrate the pattern. Here the information introduced towards the end of one sentence is used as the starting point of the next sentence.

> Transform fault zones are areas on the earth's surface where two lithospheric plates *slide past other*. *The movement* can result in earthquakes.
>
> As a result of heat and pressure deep within the Earth, *currents are created in the molten rock of the asthenosphere*. *The currents* slowly *drag the lithospheric plates horizontally past each other*. *As they move*, any crustal material which they carry is subject to *considerable pressure*. *This pressure* on the Earth's crust can cause many zig-zag cracks to develop.

- Tell students that in this activity they will work in groups to match pieces of text to form a whole text.
- Distribute to each group BLM 13, which has been cut into strips .
- Students complete the task.
- After about ten minutes ask students to suggest the sequence.
- Ask students how they completed the task, i.e. what keys they used. Identify the sentence patterning using an overhead transparency of BLM 12 and suggest that it is typical of most successful texts which explain.

Assessment:

To assess students' understanding of technical vocabulary and knowledge of the field, ask students to complete a cloze exercise of the rearranged text from which technical language has been deleted. BLM 14 can be used for this purpose.

Phase: Modelling and deconstruction

Activity 11

Purpose:

To introduce students to the organisation and language features of a causal explanation.

In this activity the teacher explicitly deconstructs the model causal explanation. The students are shown some of the characteristic features of a successful causal explanation. Since students may be familiar with the explanation text type, opportunities for them to demonstrate their prior knowledge are included.

- Refer to BLM 12, which was used in the previous activity.
- Ask students to suggest a purpose for this type of text.
- If students are not familiar with a causal explanation you may need to point out that there are different types of explanations in geography and that this is one.

> The purpose of this type of explanation has been defined as: "To explain why an abstract or not readily observable process occurs. The phases in the process are explicitly linked in a cause and effect relationship". (*Exploring literacy in school geography*, Disadvantaged Schools Project, Metropolitan East Region, 1996)

- Ask students to identify and describe the typical stages of an explanation.
- Note the stages on the overhead transparency (see BLM 15).

Focus text: Causal explanation

Causal explanations are usually organised in the following way:

1. *Phenomenon identification or general statement*

   This section identifies and gives general information about the topic.

2. *Implication sequence*

   This section includes one, or in some cases, more than one cause and effect sequence of events. In the example following, a lack of scientific background knowledge to explain why the segments lock and unlock means that the event sequence is broken into three parts. Students will be shown this later when they begin the cause and effect activity in Activity 12.

Language features of causal explanations

- Use of technical language, e.g. *lithospheric plates, transform fault zone.*
- Use of technical words to name abstract concepts. These abstract words often refer to processes, e.g. *pressure, movement* rather than "presses on" and "moves".
- Verbs are usually in simple present tense, e.g. *drag, move, store, is.*
- Use of words which demonstrate cause and effect links, e.g. *as a result, can cause, can result.*
- Use of words which demonstrate a time sequence, e.g. *when, as.*

- Suggest to students that the sequence of events is the backbone of the explanation, which is why so many activities so far have been focussed on it. Ask students how they would recognise an event. (It would have an action verb: see BLM 15.)
- Remind students of the characteristic sequence pattern of explanations identified in Activity 10.

In this explanation the pattern is interrupted as the sequences of cause and effect end and begin.

- Suggest to students that the next activity will focus on cause and effect. At this stage do not identify ways of expressing cause.

Phase: Joint construction

Activity 12

Purpose

To develop an understanding of the relationship between cause and effect and which words express cause and effect.

Students will work in groups to match statements of cause and effect. These statements are recorded in three cause and effect tables. Students then suggest words which link cause and effect statements. Finally students compare a worksheet which shows a variety of expressions of cause and effect.

- Enlarge and photocopy BLM 15a and b (cards) and BLM 16 (tables) onto two different coloured pieces of card to create sufficient sets of cause and effect cards.
- Distribute sets of cards and refer students to BLM 12 (explanation text) to students.
- Students use the explanation text to complete the activity.
- Ask students to suggest a pattern they see emerging in their table.

> Students may notice that the effect of one event becomes the cause of a subsequent event. In this way the sequence is developed. Lack of field knowledge sometimes means a break in the series of statements.

- Ask students to locate words from the text which indicate cause. Identify these and others using BLM 17.

Activity 13: Case study – Newcastle

Purpose

To examine the causes and consequences of the Newcastle earthquake.

Joint construction

- Ask students to recall orally how intraplate earthquakes occur.
- Use the students' oral explanations to jointly construct an explanation of how intraplate earthquakes occur.
- Refer to the model text in Activity 11 for the organisation and language structures and features of an explanation text (BLM 12).

Opening the field

- Remind students that the Newcastle earthquake was an example of an intraplate earthquake.
- Assist students to locate Newcastle on a map and determine its approximate distance and direction from their school and from other major towns and cities in NSW.

> *Note to the teacher:*
> If students are not familiar with the use of a scale and compass directions, these concepts will need to be taught.

Extension activity

Students use the Internet and other resources to research the year, location and magnitude of other earthquakes in Australia.

Demonstrate for students how information such as this can be recorded most efficiently in a table. Provide students with the following headings under which they can record their findings. Students should use maps to locate the site of the earthquakes. They may include the longitude and latitude of these sites if they are familiar with these terms.

Discussion could focus on the comparative magnitudes of the earthquakes and possible reasons for the differences in the damage bill.

Examples of earthquakes in Australia

Year	Location	Richter Scale*	Insured damage / Comments
1892	Launceston, Tas	6.9	unknown - offshore
1903	Warrnambool, Vic.	5.3	$0.39m
1946	Launceston, Tas	6.0	unknown - offshore
1954	Adelaide, SA	5.4	$78m
1961	Robertson, NSW	5.6	$3.7m
1968	Meckering, WA	6.9	$10m / 16 injured
1972	Wilpena, SA	5.3	unknown
1973	Picton, NSW	5.5	$2.5m
1985	Lithgow, NSW	4.3	$0.1m
1988	Tennant Creek, NT	6.8	$2.3m
1989	Newcastle, NSW	5.6	$1,000m / 13 dead / 150 injured

Key: m = millions of dollars in damage

Adapted from Doolan C. (1995) *Hazard Wise*.

* It may be necessary to provide a brief explanation of the Richter scale. This term could then be added to the vocabulary list.

Teacher notes:
The Richter Scale which was developed by Charles Richter in 1935 is the only one used to measure the magnitude of earthquakes. Each increase of one on this scale represents an increase of 30 in energy released. Thus, an earthquake with a magnitude of 7 is 30 times more powerful than one which measures 6 on this same scale and 900 times more powerful than one with a magnitude of 5. In theory, the scale does not have an upper or lower limit, although the largest possible earthquake is believed to be between 8.5 and 9.0 because even the strongest rocks can withstand only a certain amount of pressure before breaking.

Phase: Building field knowledge and joint construction

Activity 14: Jigsaw reading and joint construction of a descriptive report

Purpose

To develop understandings of the built and natural environments of Newcastle so that students are able to recognise the impact of the earthquake on the city. To develop students' skills in researching and notetaking and writing a descriptive report.

Writing a class descriptive report

Organise students into groups and assign each group one aspect of Newcastle to research. Two groups may research the same area.

Jigsaw technique

Allocate students to different groups to gather information on various aspects of a topic. Each member of the group becomes an "expert" on that group's area. New groups, sometimes known as "home groups", are then formed, each with an expert from all the original groups. Experts take responsibility for passing on the information they have gained so that they may all contribute to the final task.

The areas to be investigated should include:

- Location
- Topography
- Products and industries
- History of the region

Vocabulary development

During this introductory phase and the following research, students should be encouraged to add new words and their meanings to their word list. Students could investigate the derivation and meaning of words such as *topography* and other words which have the suffix "graphy". These could form the basis of a spelling list.

- Assist students to gather information about the city of Newcastle from a range of sources, including the Internet, maps, books and newspaper articles.

Reading to locate

This involves students reading or viewing a text in order to find specific information. Students can be supported in doing this if they are taught how to use contents pages, menus, indexes, etc. to locate appropriate sources of information. Students should be taught how to scan a text by reading headings and subheadings and looking for key words such as numbers or names.

Reading for detail

This involves students reading a text closely for information. Students can be supported in this if they are introduced to the technical language they will encounter prior to reading or viewing the text. They should also be taught how the information is likely to be organised in the text and how particular grammatical features link the text. This includes learning how texts are linked through time, by cause and effect and through comparison.

Students should be shown how to make notes using graphic outlines and how to critically analyse information from a range of sources.

- The "expert" groups work to jointly construct one or more paragraphs about the topic they have been assigned. If necessary revisit with students the model descriptive report "Structure of the earth" and the structure of topic sentences or section previews (BLMs 7 and 8).

  During this phase the teacher should move amongst the groups assisting them to draft and edit their work.

- Each "expert" now joins a "home group" where they share their sections of text and a complete text is assembled. Some of the negotiation and discussion should focus on the most appropriate ordering of information, e.g what should be the first paragraph, etc.
- The completed jointly-constructed texts can be copied onto an overhead transparency or displayed for discussion. Discussion should focus on the authenticity and organisation of the information and the appropriateness of the grammatical structures and language. Where necessary model the technical language students need to use.
- Using an overhead transparency and acting as scribe, work with the students to construct a new text "Newcastle", from the previous texts. This can later be copied for all students to include in their workbooks.

> *Note to the teacher*
> Before commencing with a case study of the Newcastle earthquake, the students will need to understand that geography is a holistic discipline, that is, one that draws from the physical sciences, humanities and arts. Tell students that they will be examining a range of text-based material, written by experts in different fields, along with photographs and maps. These resources will assist them to understand that the causes and consequences of the earthquake affected, not only the Newcastle community, but all levels of government, insurance companies, the wider community and other organisations. Such extensive information is essential for geographers to be able to make informed decisions about the problems experienced when people live in an environment which is subject to earthquake activity. Solutions need to be found to the problems of people who wish to continue to live in these environments and can be achieved only by integrating information from a variety of sources.

Activity 15: Reading to identify the main ideas

Distribute the newspaper article *Newcastle earthquake* (BLM 18).

Provide students with the following questions. Tell them that they will be reading the newspaper article in order to find some of the answers.

Ensure that students are able to interpret the questions and remind them of the earlier work on reading newspaper articles.

1. When did this earthquake occur?
2. Where did this earthquake occur?
3. What was the magnitude of the earthquake?
4. What was the scale of the damage at a local and regional level?
5. What were some of the consequences of the earthquake on the lives of Novocastrians?

Phase: Independent construction

Activity 16: Writing a summary

- Explain to students that a summary is a brief but detailed statement of the main issues which relate to a particular topic.
- Tell students that they already have a good deal of information about the earthquake from the newspaper article they have read.
- Demonstrate how the questions they have responded to form a scaffold for writing a summary of the key features of the Newcastle earthquake.
- Elicit from students the key words and phrases from the questions and use these to form headings, e.g.
  - When
  - Where
  - Magnitude
  - Scale of damage
  - Consequences.

  These headings can be used as a note-taking guide as students research other sources. This may lead to discussions about variations in the accounts of such things as the number of deaths and injuries and the total cost of the damage.

Critical literacy

- Ask students to compare information from different sources, e.g. an Australian daily newspaper dated December 28 or 29, 1989 and a text book. Discuss any inconsistencies. This may lead students to consider how the differences in time between the event and the writing and the different audiences and purposes of the texts could result in different aspects being emphasised.

> *Note to the teacher:*
> One of the key competencies embedded in the geography syllabus relates to the collection, organisation, analysis and communication of information. (Stages 4-5 *Geography Syllabus*, page 8, 1998). Having collected information about the earthquake, geographers extract the information needed to answer various questions. Communicating geographical information requires that students be able to draw on reading, listening to and viewing a range of information sources and to present this information using a variety of oral, written and non-verbal text types. (ibid. page 8)

Phase: Building field knowledge and joint construction

Before students can proceed with their study of Newcastle, they need to understand what the term "community" means. The knowledge gained from the newspaper extract will help formulate their ideas about Newcastle as a community.

Note to the teacher:

The term community has a special meaning in relation to the syllabus. Specifically, a community refers to two human elements of environments: shared space and shared social organisation.

According to Stowell and Elliott (*Geography Matters* 1, 1992, p. 40), the community can be the place or area in which people live. It comprises the people, places and objects that are familiar to the inhabitants of a local area, referring to the shared space element of the environment.

However, a community does not need to be a particular place or area. Some communities form when people who have similar interests come together. Sporting groups and people of the same religion are examples of communities which include people who don't necessarily live in the same suburb or area but who come together because of a common interest.

See: Stowell, Stowell & Elliot (1992). "What is a Community?" in *Geography Matters*, Jacaranda Press.

Activity 17: Mind mapping – Community

Purpose:

To allow the students to explore the concept of a community by drawing on their own experiences and those of other students, in a cooperative and supportive environment.

Form groups of 3 or 4 students.

Provide each group with a sheet of A3 paper and a felt pen.

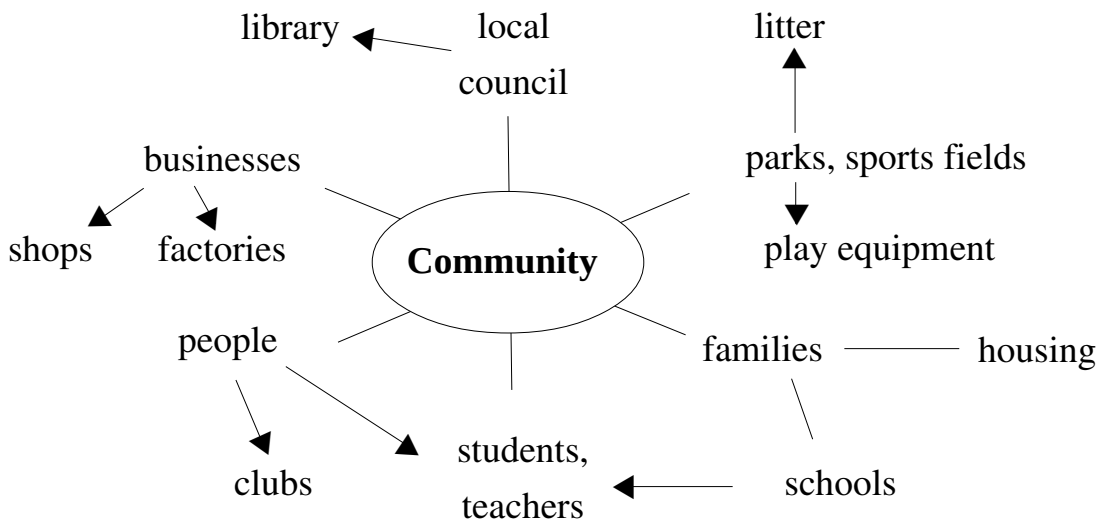
Appoint one group member as recorder.

Procedure

1. In the middle of the A3 piece of paper, write the word *community*. Draw a circle or ellipse around this word.
2. Ask students to think of the things that are found in the community in which they live and write these responses on the paper.

Activity 17 continued…

Sample mind map



3. Continue until the mind map is as detailed as possible.
4. Each group should then report to the class and a class mind map can be developed. The teacher can then draw out the similarities and differences between communities that may exist within the classroom, paying particular attention the distinction between shared space and shared social organisation.

The purpose of this phase is to build on students' knowledge of the causes of earthquakes and their understandings of what constitutes a community to examine the effects of the Newcastle earthquake on its community over time.

Phase: Building field knowledge and joint construction

Activity 18: Reading and interpreting an isoseismal map

Make an overhead transparency of an isoseismal map of the Newcastle earthquake.

Use the map to explain the magnitude of the earthquake and the extent of the impact on surrounding areas.

Locate the epicentre on the map and the depth at which the earthquake occurred.

Students should add these new terms to their vocabulary list along with their meanings.

Discuss with students the range of impacts on the areas affected by the earthquake in relation to their distance from the epicentre.

Activity 19: Interpreting photographs

Purpose

To develop skills in reading visual images in order to create a new text.

Provide students with copies of a range of photographs of the earthquake taken from a number of perspectives, i.e. ground level, low level, oblique level and aerial views. Photographs can be down-loaded from the Newcastle earthquake site at:

http://www.infohunt.nsw.gov.au/newcastl/library/eqdb/earthq.htm.

Ensure that students can recognise the different perspectives from which the photographs have been taken and are familiar with the terms. Discuss with students how the different camera angles present different interpretations of the same image. Ask students to predict why the photographer may have chosen a particular way of organising the image. Sample photographs have been provided as BLMs 1 and 19.

Highlight other choices which the photographer makes, such as how the image will be framed, what will be presented in the foreground and what will appear in the background.

Explain to students that photographs are useful tools in the study of geography because they can be used to:

- show outstanding natural features, e.g. waterfalls, as well as cultural features, e.g. pyramids, cities
- compare different places in different parts of the world
- record how places change over time
- record events, e.g. a volcano before, during and after eruption
- provide evidence of unusual or rare features of places
- show places that may be expensive or difficult to reach
- provide information about people whose way of life is different from our own
- convey information that cannot be shown in any other way
- communicate information more effectively when describing people, places and events.

adapted from: Bonnor C. and Ralph B. (1985).
Key Skills in Geography. Addison Wesley Longman, Melbourne

Activity 19 continued…

Note to the teacher: **Ground level photographs** are taken from the ground, looking across to the area being photographed.

Oblique aerial photographs are usually taken from an aeroplane, looking down at an angle of 20º to 45º.

Vertical aerial photographs are those taken from an aeroplane, looking straight down on the area being photographed.

When using photographs in geography, students learn how to observe, record and interpret what they see.

Step 1: Observation

Observation refers to looking at the photograph carefully to find out what it shows, where and when the photograph may have been taken and who may have been the audience for the photograph. Students should identify natural and cultural objects.

Step 2: Recording

Students should record what they observe as a sketch or line drawing. Key features of the photograph should be labelled.This record enables them to retrieve their observations at a later date without relying on their memories.

Step 3: Interpretation

Interpretation requires students to think about and analyse the things they are observing and recording. Students should be supported in moving beyond the literal interpretation of what they see in order to analyse more critically the images being presented.

They should be encouraged to ask questions such as:

- What event, message or meaning does the photographer wish to convey?
- What has the photographer chosen to feature and how has this been done?
- How does the angle chosen by the photographer contribute to the meaning being portrayed?

Using the Internet:

The following site links to a database of the 1989 Newcastle earthquake:

http://www.infohunt.nsw.gov.au/newcastl/library/eqdb/earthq.htm

This site contains a number of photographs of the Newcastle earthquake.

Students might use a hand-held lens to assist in discriminating fine details in the photographs.

Brainstorm with students the extent and nature of the damage they observe. As students offer suggestions, using everyday terms to describe the buildings and architectural features, model for them the correct terms. A glossary of technical terms could be developed.

Sample glossary

Technical term	Meaning
retail premises	building used for selling goods directly to consumers, e.g. *supermarket*
commercial premises	buildings used for trade and commerce, e.g. *bank*
awning	a roof-like shelter over a door or window, often made from canvas
facade	the face or front of a building
shopfront	the part of the building which is directly accessible to the public

Following are some sample questions which students might use to guide their observations and recording, using BLM 19, which shows Beaumont St, Hamilton.

- What types of materials have been used in these buildings?
- How many storeys do these buildings have?
- How many workers can be identified in this photograph?
- Why are the workers wearing “hard hats”?
- What parts of the building have been most severely affected?
- Could this damage have been caused by fire? If no, why not?
- If yes, why? What evidence do you offer to support your answer?
- What evidence do the photographs provide to suggest that the damage was caused by an earthquake?

Phase: Building field knowledge and joint construction

Activity 20: Effects of the Newcastle earthquake

Purpose

In the next phase students will examine the socio-economic impact of the earthquake.

Organise students into small groups.

- Provide each group with copies of four reports which describe the effects of the earthquake from different perspectives. These reports have been included as BLMs 20a-d.
- Give each group a copy of *Beaumont Street, Hamilton, Newcastle: A community study* (BLM 21.)
- Explain to students the purpose of each of the texts and how each perspective contributes to a balanced understanding of the impact of the earthquake on the community.
- Tell students that as they read the texts they will use the information to construct a summary of the key aspects of the earthquake. The summary should be completed on BLM 23. BLM 22 can be used for guided notetaking.

> *Note to the teacher:*
> For this task it may be necessary to group students who are experiencing difficulties with more confident peers. The final task may be modified, with some students needing to complete only some sections of the grid.

A summary of the reports

Report No. 1: Photogrammetry – is concerned with being able to measure accurately (quantify) the damage sustained by buildings by taking photos of those buildings. This report provides two examples where surveyors from Newcastle University were engaged to assess the damage to community buildings.

Report No. 2: Geological report – deals with where, when and why this earthquake occurred. A brief mention of the effects of this earthquake is also provided.

Report No. 3: Effects of damage – The cost of repairing damage to specific government buildings is provided and indicates how much progress has been made one year after the earthquake.

Report No. 4: The Newcastle Earthquake: My personal experience – recounts the experience of Stella Hawkins, a Novocastrian.

Assessment

Each group reports back the results of its investigation. Highlight the importance of including only relevant information. Discuss any differences in interpretation.

Phase: Building field knowledge

Activity 21: Case study 2

Northridge, Los Angeles

Explain to students that geographers are often required to locate information from tables. In the following activity, students are required to use their understanding of latitude and longitude to plot the distribution of earthquakes in continental America.

Ask students to use a map of the Pacific Rim countries to determine Australia's location in relation to the west coast of America.

Ask students to locate the following: (the) Pacific Ocean, Gulf of California; the states of Oregon, Washington, California, Nevada and Arizona; Mexico; and the cities of San Francisco and Los Angeles.

Provide students with a copy of BLM 24: *Examples of earthquakes in America.*

Point out the headings for each column.

Ask students to predict what forms of information are likely to be found under the headings.

Demonstrate for students how to locate specific pieces of information.

Ask students to use their maps to locate the places where earthquakes have occurred within America.

Remind students of the explanation of the Richter scale which was given in the study of Newcastle. Explain that in the United States the Mercalli scale is also used to measure the intensity of earthquakes.

In this phase students develop understandings about the built and natural environments of the city of Los Angeles and the State of California by reading reports and maps. Discuss each report before it is read so as to provide an opportunity to introduce and reinforce some of the technical words typically associated with reading this type of report. As this terminology is being established students are being explicitly moved from their everyday vocabulary to a more technical geographical vocabulary. This movement will assist them when they begin to read geographical material independently. The teacher may also use this oral phase of field building to identify information which would be most relevant to a geographer. This exercise will assist students when they are required to independently select appropriate geographic information from a variety of sources.

Model and deconstruct the language patterns chosen by geographers when they locate and define something. This deconstruction will help students to read and write in a geographical manner.

Remind students of the work they have done previously on descriptive reports.

Phase: Building field knowledge and joint construction

Activity 22

Purpose:

To introduce students to the physical features and human activities associated with Los Angeles.

Students will use their knowledge of adjectives which classify and describe in geography and their skills in locating places on maps to complete a cloze passage. (BLM 25.)

The text will also provide them with some knowledge of the history and development of the Los Angeles area.

Provide students with a map which shows the states of the west coast of the United States as well as the major cities of this region and a map of California, such as that found on *Encarta*, to help them complete the following cloze.

Before students begin to read the text, ask them to locate each of the headings and to predict what types of information they would be likely to find under each of them. Record these predictions on the board so that they can later confirm or alter their thoughts.

The reading task and cloze exercise could be completed as a teacher-led joint construction or by groups of students.

Phase: Independent construction

Activity 23: Descriptive report

Students write a descriptive report about Los Angeles.

Tell students that their reports should contain information about the location, topography and economic activities of the Los Angeles area and the ways in which natural forces have affected the residents of the area.

Prior to beginning to write, provide students with the assessment criteria (BLM 26) which they can use to evaluate their work.

The Internet address for the site, *Recent earthquakes in California*, is:
www.scecdc.scec.org/recenteqs/Maps/Los_Angeles.html
This site is a useful source of additional information about the Los Angeles area.

Phase: Building field knowledge and modelling

Activity 24: Reading for information

Provide students with a copy of BLM 27, *The master fault*. This text provides the information required to develop the necessary field knowledge regarding why Los Angeles experiences many severe earthquakes. As students read the text, they should be asked to refer to the map of California which was previously distributed.

Using the *before, during, after* strategy, support students as they read the text.

Before reading

- Discuss with students the title of the text. Ask them to predict what the text may be about. Record the students' predictions for later reference.
- Ask students to locate the topic sentences for each paragraph. Remind them that the topic sentence is not always the first sentence in the paragraph. When all students have located the appropriate sentence, ask them to underline it.
- Explain that topic sentences contain the main idea for the paragraph.
- Ask students to restate the main ideas in their own words. Provide support and correction if necessary to ensure that all students can understand the main ideas.

During reading

- Ask students to read the first paragraph then restate in their own words the key ideas or concepts. Record their oral responses to demonstrate the different ways in which we talk and write about a topic. Draw their attention to the use of technical terminology and grammatical devices for signalling cause and effect or contrastive language.
- Continue this process for the remaining paragraphs.
- Encourage students to relate the new information to what they already know about plate tectonics.

After reading

Ask students to consult their texts to answer in small groups the following questions:

- The State of California straddles the boundary between which two lithospheric plates?
- Which plate is moving in a north-westerly direction?
- Name three faults which are included as part of the San Andreas Fault system.
- Give three reasons which explain why these faults are studied by the Southern California Earthquake Centre.
- Describe how the movement of the plates in southern California is different from that in central and northern California.

Building field knowledge (continued)

Activity 25: Using the Internet

Purpose:

To provide opportunities for students to locate those specific faults which affect Los Angeles and particular communities within this city.

Students will use Internet resources:

- to investigate seven specific faults within Los Angeles
- to record the names of the communities which are located near these faults
- to record how fast these faults move.

Provide students with the following explanation of how we determine the rate of movement of faults.

How do we study faults?

Surface features that have been broken and offset by the movement of faults are used to determine how fast the faults move and thus how often earthquakes are likely to occur. For example, a stream-bed that crosses the San Andreas fault near Los Angeles is now offset 90 metres from its original course. The sediments in the abandoned stream-bed are about 2 500 years old. If we assume movement on the San Andreas has cut off that stream-bed within the last 2 500 years, then the average slip rate on the fault is 35 millimetres per year. This does not mean the fault slips 35 millimetres each year. Rather, it stores up 35 millimetres of slip each year to be released in infrequent earthquakes. The last earthquake offset the stream-bed another 4.5 metres. If we assume that all earthquakes have 4.5 metres of slip, we will have earthquakes on average every 130 years. This is calculated by dividing 4 500 millimetres by 35 millimetres per year and equals 130 years. This does not mean the earthquakes will be exactly 130 years apart. Where the San Andreas fault has averaged 130 years between events, earthquakes have occurred 45 years and 300 years apart.

Geologic rates

The movement between the Pacific and North American plates is about 45 millimetres each year, which is about how fast fingernails grow. This movement has been going on for eons. Los Angeles City Hall is now 3 metres closer to San Francisco than when it was built in 1924. It would take 2.2 million years for your nails to extend the 100 kilometres from San Bernardino to Palmdale. It took many millions of years for faults to slip enough, and rocks to move enough, to shape southern California's current landscape.

Reference: *Life on the edge, the master fault* ***http://www.scecdc.scec.org/masterfault/.html***

Assist students to locate the following address, which is the address for *Los Angeles Basin Seismicity.*

http://www.scecdc.scec.org/labasin.html

This address provides a map of the Los Angeles area showing the major faults. Plotted on this map are the epicentres of the largest earthquakes which have occurred in the area since 1932. Five are highlighted and linked to *Faults in California, Los Angeles Region*.

Click on the Los Angeles area fault map at:

http://www.scecdc.scec.org/lafault.html

BLM 28 is a black-and-white copy of the colour page which students will see on the Internet. It is provided for students to use to record information about some specific faults.

Using BLM 29a, locate each of the seven faults listed.

Note:
Click on the alphabetical index of faults and then find the *Hollywood fault*.
The cursor will change from an arrow to a pointing finger and the name of the specific fault will be displayed in the area just above the task bar, on the lower left-hand side of the screen page.

Click on *Hollywood fault*. Gather information from this page to complete the table. Continue for each of the seven faults.

The task may be completed individually or in small groups.

Students compare their completed tables with that on BLM 29b and make any changes necessary.

Building field knowledge and modelling (continued)

Local area case study – Northridge earthquake

Activity 26: Researching the Northridge earthquake

Explain to students that Northridge is located 40 kilometres west-north-west of downtown Los Angeles. Ask students to find this location on their maps of the Los Angeles area.

Distribute BLM 30, a newspaper article on the Northridge earthquake.

Reading to identify main ideas

Provide students with the framework below to enable them to focus on those features of the newspaper article which are of most interest to geographers.

Tell students that they will be reading the article in order to find the following information:

- When did this earthquake occur?
- Where did this earthquake occur?
- What was the magnitude of this earthquake?
- Scale of the damage: – was it local?
  – was it regional?
- Outline the consequences of the earthquake. In what way were people affected?

(Consider the impact of death and injuries on families and friends and the damage to homes, community buildings, business premises, etc.)

Activity 26 (continued)

Purpose:

- To build on students' knowledge of the causes and effects of earthquakes.
- To support students in extracting information from a range of sources to develop an understanding that the effects of the Northridge earthquake varied over time and location.

- Issue BLM 31: *Geological report – Northridge earthquake*, to students.
- Explain to students that they will be required to complete a number of tasks using the information from the text.

Students should be prepared for reading the text by asking them to skim read the text and highlight any unfamiliar vocabulary.

Construct a vocabulary list of unfamiliar terms and their meanings, e.g.

Term	Meaning
blind thrust fault	an area where the plates move with a reverse rolling motion under the surface (hard to detect)
seismograph	record of earthquake events

List and explain the meanings of any acronyms, e.g.

Acronym	Expanded form
USGS	United States Geological Service
CUBE	Caltech USGS Broadcasting of Earthquakes
FEMA	Federal Emergency Management Agency

Reading to generate other texts

When students read a text in order to produce another text they need to be taught and supported in:

- locating and selecting the most appropriate information for their purposes
- taking notes effectively
- critically analysing sources to ensure the accuracy, validity and reliability of the information
- organising the information in the ways which the task outlines.

Building field knowledge and modelling (continued)

After the students have read this report, they will be required to do the following:

1. Construct a map which shows the location of the damaged areas in relation to Northridge and Los Angeles.
2. Construct a map, complete with a key, which shows the extent of the earthquake as well as the different types of damage that occurred.
3. Construct a note-taking grid showing the causes and effects of, and responses to, the Northridge earthquake. The effects of the earthquake should reflect a number of perspectives, e.g.
   - socio-economic
   - what happened to the ground (ground failure)
   - what the impacts of this earthquake were on the built environment, on homes, on the infrastructure
   - how people were affected
   - what the response was of the different levels of government to this disaster (Federal and State Governments).

Tell students that each of the dot points could form a heading under which notes should be made. Tell students that their notes should be not full sentences but key words and ideas.

Phase: Joint construction

Activity 27: Collecting information from photographs

Purpose

To develop the skill of using photographs as a source of geographical information.

To develop skills in critical literacy.

The following sites contain photographs from the Northridge earthquake.

Northridge earthquake photo album: **http://autoinfo.smartlink.net/quake/quake.htm**
Northridge earthquake pictures: **http:www.scecdc.scec.org/slidesho.html**

Download a number of photographs from the Internet sites and distribute these to students.

Remind students of their previous work in studying photographs.

Explain that geographers use different types of photographs: ground level, low oblique and aerial photos. Demonstrate the different perspectives in photographs and discuss why particular perspectives may have been chosen.

Discuss the value of studying photographs in geography.

Distribute a selection of photographs to groups of students.

Ask students to propose particular areas which could be investigated using the photographs.

Sample areas of investigation and prediction could include the following:

- List the natural features portrayed in the photograph.
- Identify those human features evident in the photograph.
- Describe the topography.
- What natural force(s) could have produced this level of damage?
- If fire is evident in the photograph, what service below the ground may have ignited?
- How many people may have been affected? What evidence is there to support this view?
- In what ways may people have been affected? What problems might they have faced? Give specific examples to support your argument.
- Identify the type of photograph you have been interpreting.
- Why might the photographer have chosen to frame the picture in this way?

Students could be provided with a hand-held magnifying glass to assist them in interpreting photographs and looking for detail.

Allow time for the groups to examine their allocated photographs and report their findings to the class.

Students might be asked to predict the likely consequences of broken power cables for people and businesses and what might be the consequences of disruption to telephone services.

Phase: Independent construction

Activity 28: Recording information about the Northridge earthquake

Students will read a series of articles (BLM 33-39) in order to extract information which will be recorded on the note-taking grid. (BLM 41)

Relationship to the syllabus
Each article communicates ideas and information associated with investigating the diversity of problems which arose from the Northridge earthquake.
Through this study, students gain an awareness of and develop their attitudes to a range of problems arising from the earthquake. Through studying these reports, the students will develop an awareness of the magnitude of this event as well as understanding that some issues associated with the earthquake have still not been resolved, even after four years.

Students can be supported in reading the following texts by providing them with summaries which will establish the context and orient them to the content.

Distribute and discuss the summaries (BLM 32), pointing out that they provide an overview of what will be read.

Distribute the articles, BLM 33-39.

For students who are experiencing difficulties it may be necessary to read and discuss each text to ensure that students understand the content and are able to retrieve the relevant information.

Display an OHT of BLM 41, the note-taking grid which they will use. Tell students that they will be reading the articles to extract information.

Read the headings for each section and discuss what information would address each area most appropriately.

Read one of the texts with the students and model for them how to locate and transfer the information to the grid. Demonstrate finding main ideas and transferring these into key words or concepts.

Provide students with a copy of BLM 40 which can be used to guide their note taking.

Monitor students as they complete the task to ensure they are being successful and provide additional support if necessary.

Assessment

Provide the students with the criteria which will be used to assess their work before they commence the task.

Assessment criteria

	Achieved	Developing	Support needed
The information is relevant and accurate			
Main ideas have been included			
Responses are written in note form			
Technical vocabulary has been used appropriately			
Spelling is correct			

BLM 1: Newcastle earthquake photographs

The Junction Public School was severely damaged and was finally demolished.

BLM 2

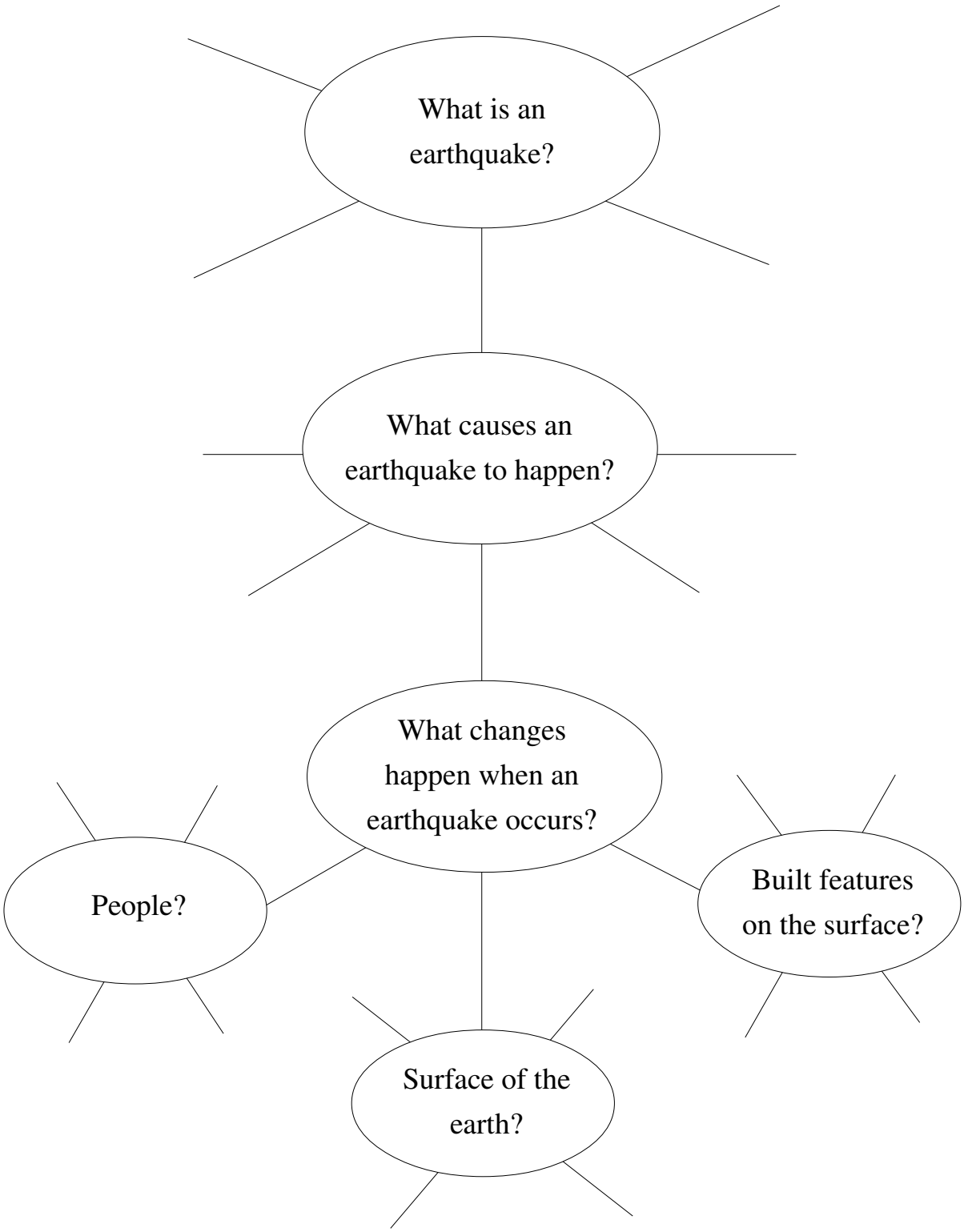
10 seconds of mayhem leaves city in shock

Frantic efforts were continuing late last night in Newcastle to rescue an unknown number of victims trapped in the rubble of Australia's worst earthquake.

The earthquake at 10.28 a.m. yesterday morning has left at least 14 people dead and more than 120 injured. Millions of dollars worth of damage was done to buildings and essential services were cut throughout the city.

Source: *The Sydney Morning Herald*, 29.12.1989, Bob Beale, Karen Davey and Wes Cornish

BLM 3: Mind map

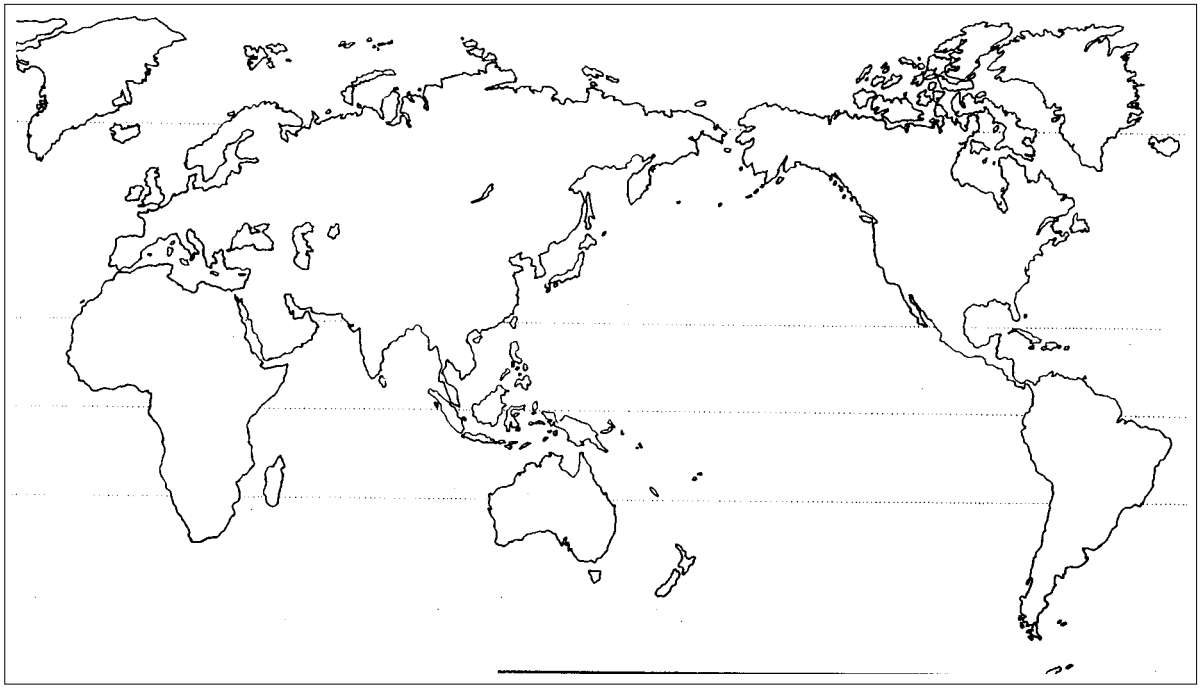


Earthquake legends

Scandanavia
The god Loki is being punished for the murder of his brother, Baldur. He is tied to a rock in an underground cave. Above his face is a serpent dripping poison, which Loki's sister catches in a bowl. From time to time, she has to go away to empty the bowl. The poison then falls on Loki's face causing him to twist and wriggle. Loki's movements cause the ground above him to shake.

Japan
A great catfish, or namazu, lies curled up under the sea, with the islands of Japan resting on his back. A demigod, or daimyojin, holds a heavy stone over his head to keep him from moving. Once in a while, the daimyojin is distracted and the namazu moves, causing the earth to tremble.

West Africa
A giant carries the Earth on his hand. All the plants that grow on the Earth are his hair while the people and animals are the insects that crawl through his hair. He usually sits and faces the east, but once in a while he turns to the west, the direction earthquakes come from in West Africa, and then back to the east, with a jolt that is felt as an earthquake.



Mexico
El diablo, the devil, makes giant rips in the Earth from the inside. He and his devilish friends use the cracks when they want to come and stir up trouble on the Earth.

East Africa
A giant fish carries a stone on his back. A cow stands on this stone, balancing the Earth on one or her horns. From time to time, her neck begins to ache and she tosses the Earth from one horn to the other.

India
The Earth is held up by four elephants that stand on the back of a turtle. The turtle, in turn, is balanced on a cobra. When any of these animals move, the Earth trembles.

New Zealand
Mother Earth has a child within her womb, the young god Ru. When he stretches and kicks, as young babies do, earthquakes occur.

Central America
The square Earth is held up at its four corners by four gods, the Vashakmen. When they decide the Earth is becoming overpopulated, they tip it up to get rid of surplus people.

BLM 5: Cloze exercise

The missing words are: crust, core, oceanic crust, mantle, lithospheric plates, continental crust, sphere, crust

The structure of the earth

The earth is a …… and is made up of a number of shells or layers. The three main shells, the crust, the mantle and the core, have been recognised for some time.

The …… is the outermost layer of the earth. It is a solid layer of rock and is the layer on which people live. There are two types of crust. The crust which forms the continents is known as the …… …… . The continental crust is between 30 and 50 km deep. The …… …… is located beneath the oceans. The oceanic crust is between 5 and 15 km deep.

The …… is a thick layer which lies beneath the ……. It contains hot rock which is both solid and molten (melted). Some parts of the earth's mantle are hotter than other parts. The mantle can be up to 2 900 km deep.

The crust and some of the mantle consist of many different masses of solid rock which are known as lithospheric plates. Each of these lithospheric plates comes together or moves apart very slowly. The area where two or more …… …… come together or move apart is known as the margin or plate boundary.

The …… is the layer which is in the centre of the earth. Parts of this layer are solid and parts are molten. The temperature of the core may reach as high as 6 650º C.

BLM 6: Completed cloze

The structure of the earth

The earth is a **sphere** and is made up of a number of shells or layers. The three main shells, the crust, the mantle and the core, have been recognised for some time.

The **crust** is the outermost layer of the earth. It is a solid layer of rock and is the layer on which people live. There are two types of crust. The crust which forms the continents is known as the **continental crust**. The continental crust is between 30 and 50 km deep. The **oceanic crust** is located beneath the oceans. The oceanic crust is between 5 and 15 km deep.

The **mantle** is a thick layer which lies beneath the **crust**. It contains hot rock which is both solid and molten (melted). Some parts of the earth's mantle are hotter than other parts. The mantle can be up to 2 900 km deep.

The crust and some of the mantle consist of many different masses of solid rock which are known as lithospheric plates. Each of these lithospheric plates comes together or moves apart very slowly. The area where two or more **lithospheric plates** come together or move apart is known as the margin or plate boundary.

The **core** is the layer which is in the centre of the earth. Parts of this layer are solid and parts are molten. The temperature of the core may reach as high as 6 650º C.

BLM 7: Descriptive report annotated to show text organisation

The structure of the earth

General statement identifies

The earth is a sphere and is made up of a number of shells or layers. The three main shells, the crust, the mantle and the core, have been recognised for some time.

Description

The crust is the outermost layer of the earth. It is a solid layer of rock and is the layer on which people live. There are two types of crust. The crust which forms the continents is known as the continental crust. The continental crust is between 30 and 50 km deep. The oceanic crust is located beneath the oceans. The oceanic crust is between 5 and 15 km deep.

Description

The mantle is a thick layer which lies beneath the crust. It contains hot rock which is both solid and molten (melted). Some parts of the earth's mantle are hotter than other parts. The mantle can be up to 2 900 km deep.

Description

The crust and some of the mantle consist of many different masses of solid rock which are known as lithospheric plates. Each of these lithospheric plates comes together or moves apart very slowly. The area where two or more lithospheric plates come together or move apart is known as the margin or plate boundary.

Description

The core is the layer which is in the centre of the earth. Parts of this layer are solid and parts are molten. The temperature of the core may reach as high as 6 650º C.

Previews are underlined.

BLM 8: Language features of a descriptive report

The structure of the earth

The earth *is* a **sphere** and *is made* up of a number of shells or layers. The three main shells, the **crust**, the **mantle** and the **core**, have been recognised for some time.

The **crust** *is* the outermost layer of the earth. It *is* a solid layer of rock and *is* the layer on which people *live*. There *are* two types of crust. The crust which *forms* the continents *is known* as the **continental crust**. The continental crust *is* between 30 and 50 km deep. The **oceanic crust** *is located* beneath the oceans. The oceanic crust *is* between 5 and 15 km deep.

The **mantle** *is* a thick layer which lies beneath the crust. It *contains* hot rock which *is* both solid and molten (melted). Some parts of the earth's mantle *are* hotter than other parts. The mantle *can be* up to 2 900 km deep.

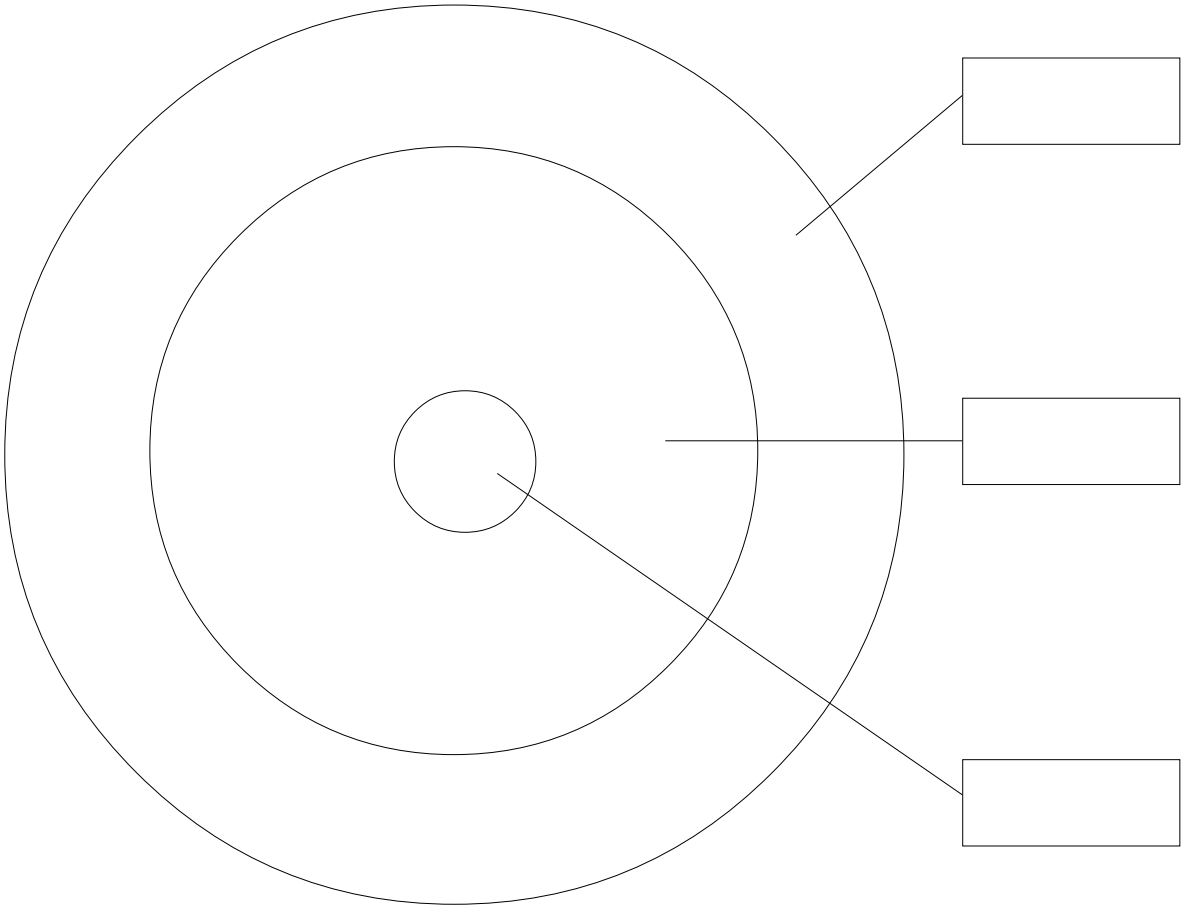
The crust and some of the mantle *consist* of many different masses of solid rock which *are known* as **lithospheric plates**. Each of these lithospheric plates *comes* together or *moves* apart very slowly. The area where two or more **lithospheric plates** *come* together or *move* apart *is known* as the **margin** or **plate boundary**.

The **core** *is* the layer which *is* in the centre of the earth. Parts of this layer *are* solid and parts are molten. The temperature of the core *may reach* as high as 6 650º C.

bold type	technical language
underlined type	thing being described is placed at the beginning of the sentence
italic type	verbs in present tense

BLM 9: Diagram for labelling

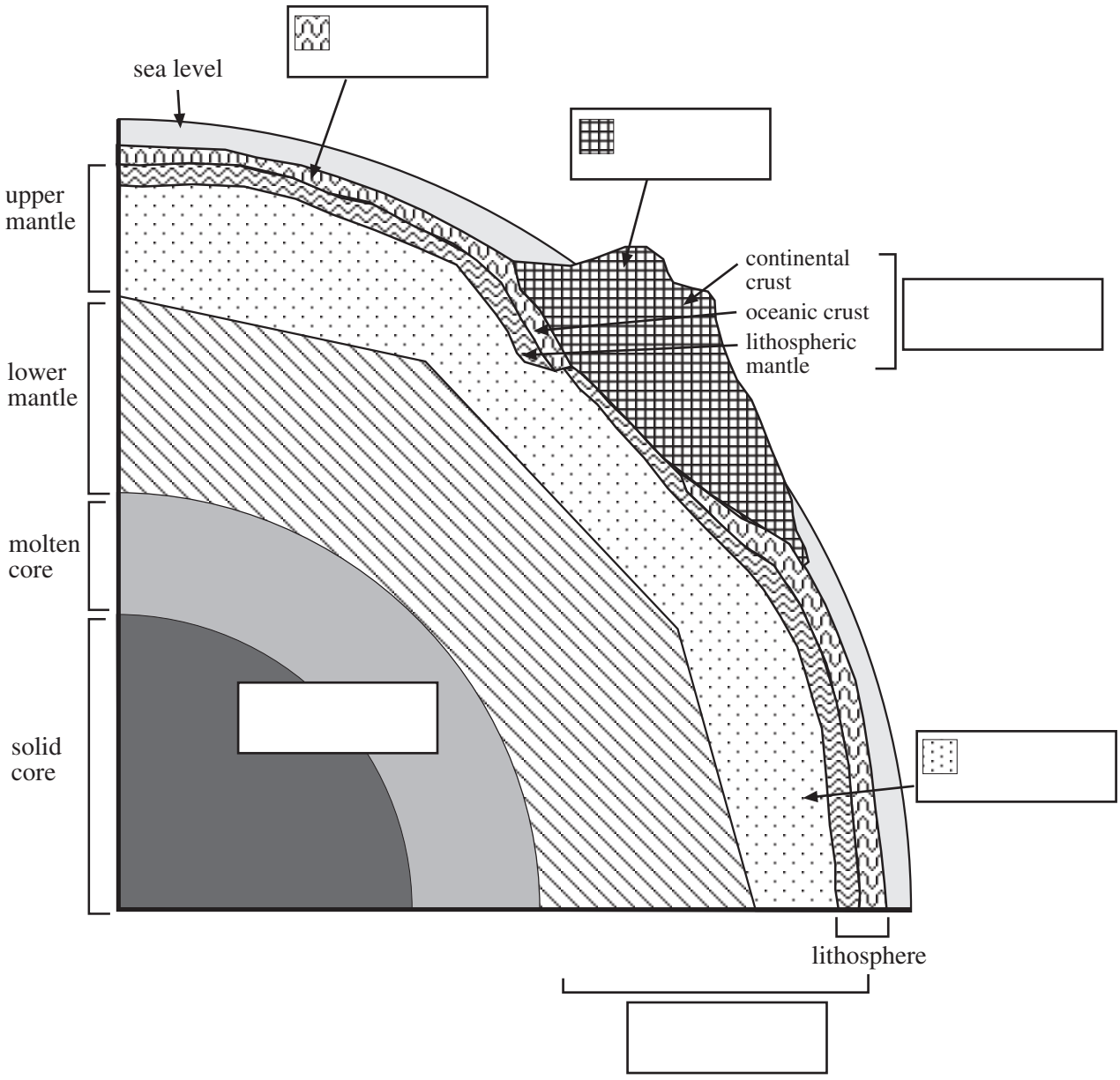
Structure of the earth



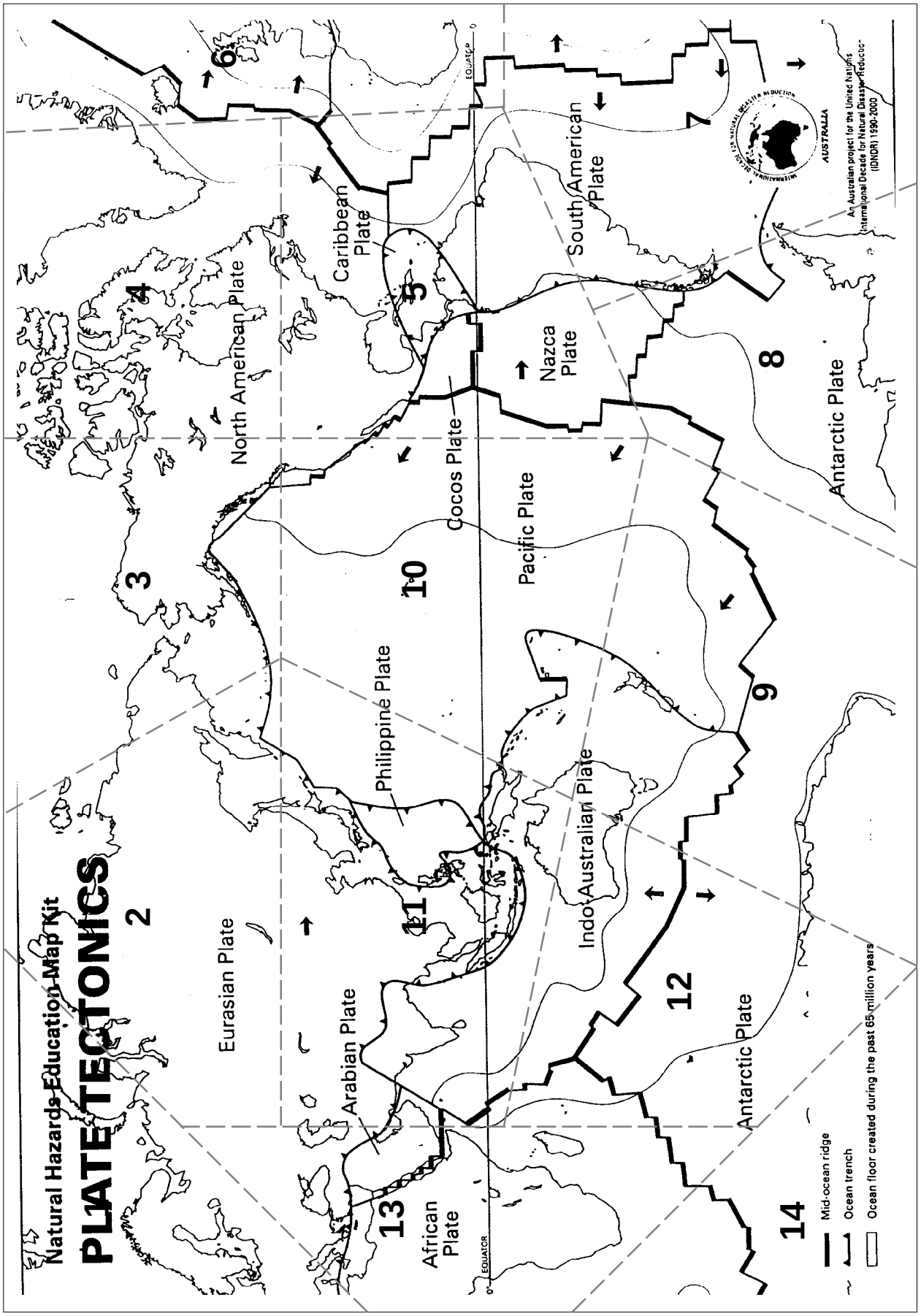
BLM 10: Building field knowledge

Use the words in the box following to label the diagram below. The descriptive report and the resources your teacher provides will also help you to do this.

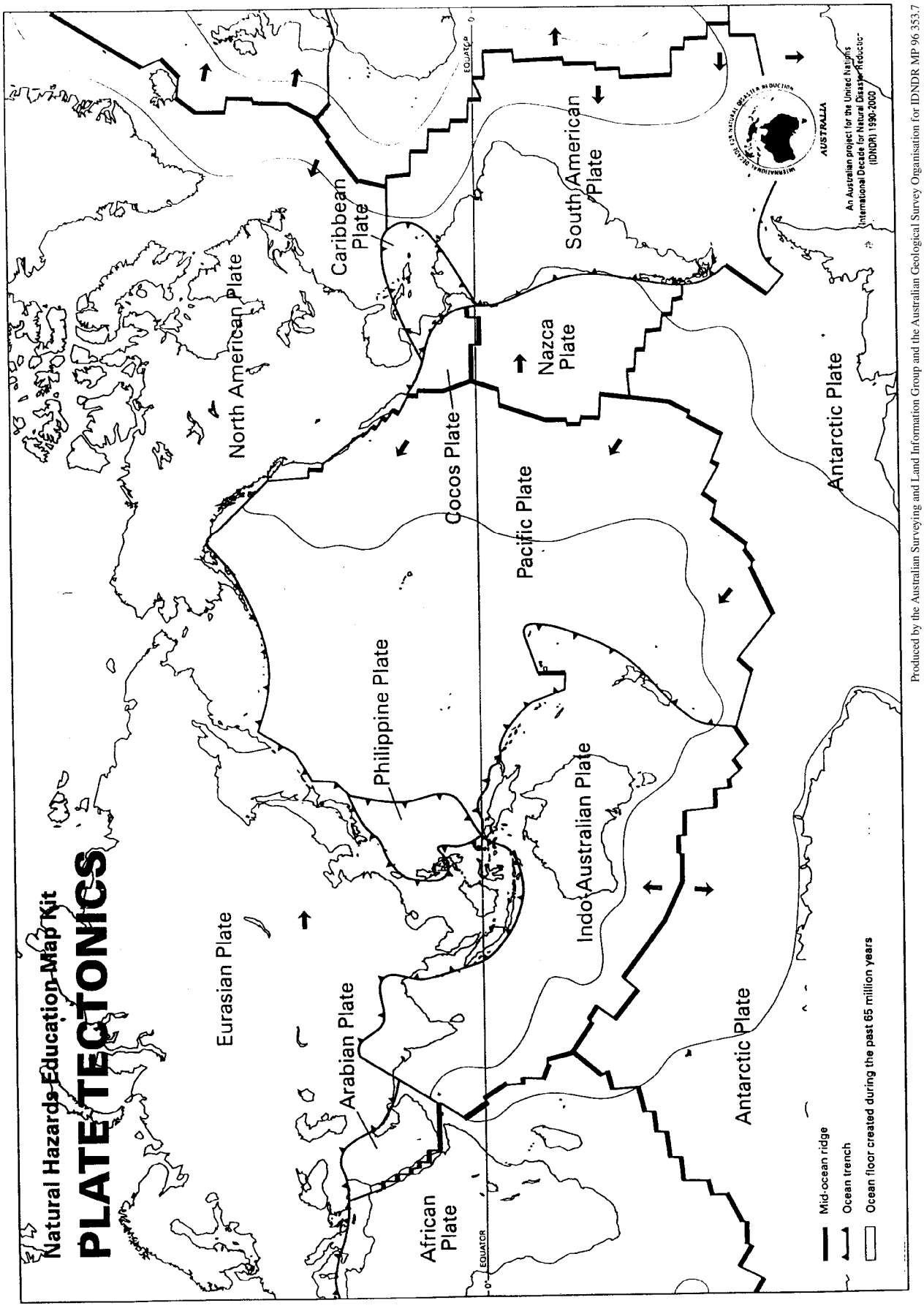
oceanic crust	asthenosphere	continental crust
core	lithospheric plates	mantle



BLM 11a: Map showing main lithospheric plates



BLM 11b: Map showing main lithospheric plates



BLM 12: Explanation text

Why earthquakes occur at transform fault zones

Transform fault zones are areas on the earth's surface where two lithospheric plates slide past each other. The movement can result in earthquakes.

As a result of heat and pressure deep within the Earth, currents are created in the molten rock of the asthenosphere. The currents slowly drag the lithospheric plates horizontally past each other. As they move, any crustal material which they carry is subject to considerable pressure. This pressure on the Earth's crust can cause many zig-zag cracks known as transform faults to develop. The cracks form a zone of transform faults at the edges of the two plates. As the edges pass each other, the zone enables the crust to move in different directions. In some areas within the zone the different segments of the crust creep slowly past each other. In other areas the segments of the crust become stuck and thus store large amounts of energy. When these finally move, the energy is released and considerable damage will result. This sudden movement is known as an earthquake. The San Andreas fault zone is an example of this type of fault zone.

BLM 13: Jumbled explanation text

Use your knowledge of the typical sentence patterms found in explanations to reconstruct this text.

Why earthquakes occur at transform fault zones

Transform fault zones are areas on the earth's surface where two lithospheric plates slide past each other.

The movement can result in earthquakes.

As a result of heat and pressure deep within the Earth, currents are created in the molten rock of the asthenosphere.

The currents slowly drag the lithospheric plates horizontally past each other.

As they move, any crustal material which they carry is subject to considerable pressure.

This pressure on the Earth's crust can cause many zig-zag cracks known as transform faults to develop.

The cracks form a zone of transform faults at the edges of the two plates.

As the edges pass each other, the zone enables the crust to move in different directions.

In some areas within the zone the different segments of the crust creep slowly past each other.

In other areas the segments of the crust become stuck and thus store large amounts of energy.

When these finally move, the energy is released and considerable damage will result.

This sudden movement is known as an earthquake.

BLM 14: Cloze exercise

Use your knowledge of earthquakes to place the missing words in the explanation below.

earthquakes, currents, energy, earthquake, crustal, pressure, heat, transform faults, lithospheric plates, zig-zag cracks, asthenosphere

Why earthquakes occur at transform fault zones

Transform fault zones are areas on the earth's surface where two _____ _____ slide past each other. The movement can result in _____.

As a result of _____ and pressure deep within the Earth, _____ are created in the molten rock of the _____. The currents slowly drag the lithospheric plates horizontally past each other. As they move, any _____ material which they carry is subject to considerable _____. This pressure on the Earth's crust can cause many _____ - _____ _____ known as transform faults to develop. The cracks form a zone of _____ _____ at the edges of the two plates. As the edges pass each other, the zone enables the crust to move in different directions. In some areas within the zone the different segments of the crust creep slowly past each other. In other areas the segments of the crust become stuck and thus store large amounts of _____. When these finally move, the energy is released and considerable damage will result. This sudden movement is known as an _____. The San Andreas Fault Zone is an example of this type of fault zone.

BLM 14a: Completed exercise

Use your knowledge of earthquakes to place the missing words in the explanation below.

earthquakes, currents, energy, earthquake, crustal, pressure, heat, transform faults, lithospheric plates, zig-zag cracks, asthenosphere

Why earthquakes occur at transform fault zones

Transform fault zones are areas on the earth's surface where two *lithospheric* *plates* slide past each other. The movement can result in *earthquakes*.

As a result of *heat* and pressure deep within the Earth, *currents* are created in the molten rock of the *asthenosphere*. The currents slowly drag the lithospheric plates horizontally past each other. As they move, any *crustal* material which they carry is subject to considerable *pressure*. This pressure on the Earth's crust can cause many *zig* - *zag* *cracks* known as transform faults to develop. The cracks form a zone of *transform* *faults* at the edges of the two plates. As the edges pass each other, the zone enables the crust to move in different directions. In some areas within the zone the different segments of the crust creep slowly past each other. In other areas the segments of the crust become stuck and thus store large amounts of *energy*. When these finally move, the energy is released and considerable damage will result. This sudden movement is known as an *earthquake*. The San Andreas Fault Zone is an example of this type of fault zone.

BLM 15: A causal explanation deconstructed

Phenomenon identification

Identifies and gives general information.

Why earthquakes occur at transform fault zones

Transform fault zones are areas on the earth's surface where two lithospheric plates slide past each other. The movement can result in earthquakes.

Implication sequence

Shows a series of events linked in cause and effect relationships.

Action verbs which form the event sequence.

Words or word groups which express cause and effect.

As a result of heat and pressure deep within the Earth, currents **are created** in the molten rock of the asthenosphere. The currents slowly drag the lithospheric plates horizontally past each other. As they move, any crustal material which they carry is subject to considerable pressure. This pressure on the Earth's crust **can cause** many zig-zag cracks known as transform faults to develop. The cracks form a zone of transform faults at the edges of the two plates. As the edges pass each other, the zone enables the crust to move in different directions. In some areas within the zone the different segments of the crust creep slowly past each other. In other areas the segments of the crust become stuck and **thus** store large amounts of energy. When these finally move, the energy is released and considerable damage **will result**. This sudden movement is known as an earthquake. The San Andreas Fault Zone is an example of this type of fault zone.

BLM 15a: Cause statements

heat and pressure build up

the currents cause movement

lithospheric plates drag past each other

considerable pressure is exerted on crustal material

zig-zag cracks develop

zone of transform faults is created

crust becomes stuck

the stuck crust moves

energy is released

BLM 15b: Effect statements

currents are created

lithospheric plates drag past each other

considerable damage is caused to crustal material

zig-zag cracks develop

zone of transform faults is formed

parts of the crust move in different directions

energy is stored

energy is released

an earthquake results

BLM 16: Cause and effect statement

Cause and effect table

Use the information in the text *Why earthquakes occur in transform fault zones* to match the large cause and effect statements. Record your answers in the table below.

Cause	Effect
Heat and pressure	
movement	causing considerable pressure on crustal material
	parts of the crust can move

Cause	Effect
	energy is stored

Cause	Effect
	energy released as earthquake

BLM 17: Ways of expressing cause and effect

Ways of expressing cause and effect

A summary of language resources for expressing cause and effect relationships.

Text characteristics	Language resource	Examples	Examples using the text
more like writing	Cause as a thing	the effect (of…) the cause (of …) the result (of…)	The effect of heat and pressure within the mantle is to create currents. The cause of the currents is heat and pressure in the mantle.
	Cause as a verb	causes creates results in leads to	Heat and pressure cause currents in the mantle. Heat and pressure result in currents in the mantle.
	Cause as an adverbial phrase	Because of … … due to …	Because of heat and pressure, currents are created in the mantle.
	Conjunctions • between sentences • within sentences (dependent clauses) • independent clauses	thus consequently therefore because and	Heat and pressure are exerted. Thus currents are created in the mantle. Because heat and pressure are being exerted, currents are created in the mantle. Heat and pressure are exerted and currents are created in the mantle.

This table was modified from page 71, *Exploring literacy in school geography*, Disadvantaged Schools Program, Metropolitan East Region, NSW Department of School Education, 1996.

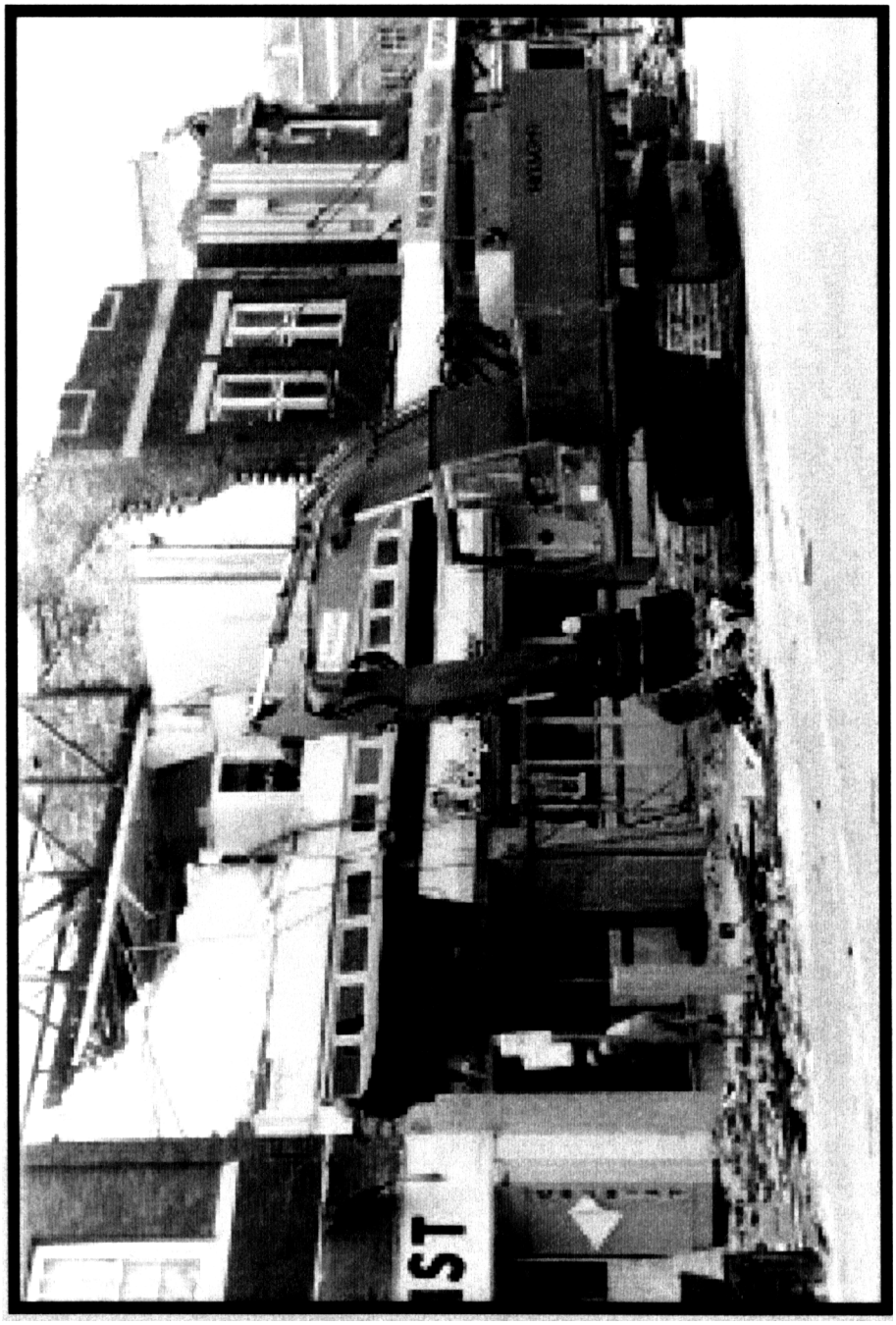
BLM 18

Newcastle earthquake

At 10.27 am on 28th December, 1989, Australia's most damaging earthquake struck Newcastle, the sixth largest city in the country. Although measuring only 5.6 on the Richter scale, the shallowness of the earthquake, somewhere between five and eleven kilometres below the earth's surface, and its location near a built-up area, meant that it caused damage much greater than would normally be expected of an earthquake of this size. Shockwaves spread out from the epicentre, some 15 kilometres south-west of the city centre, near Boolaroo, to be felt up to 500 kilometres away. However, the most serious effects were felt in the city itself. There were 12 deaths and 106 injuries, very few considering 35 000 homes and 3 000 other buildings were moderately to severely damaged in Newcastle. Older buildings suffered the most. At the Kent Hotel, in Beaumont Street, three deaths occurred. The nine others resulted from the partial collapse of the Newcastle Workers' Club, the inner city's largest club. Three floors collapsed trapping many people.

Adapted from C. Dolan, (1995). *Hazard Geography*.

BLM 19: Beaumont Street photograph



BLM 20a: Report no. 1

Photogrammetry

This work can be related to the Internet site and the photographs the students have already seen of Newcastle. Further, this report links to the damage to Hamilton and how this damage has affected the community of Hamilton.

The following report is adapted from a speech on damage to buildings following the Newcastle earthquake by the Head of the Department of Civil Engineering and Surveying, Newcastle University, J. G. Fryer.

Unlike the majority of people here, I am not an engineer, but a surveyor. Surveyors are recognised as the experts in measuring. A group of people within the Department of Civil Engineering and Surveying have specialised in photogrammetry over the last fifteen years. Photogrammetry is the science of measuring from photographs.

About one week after the (Newcastle) earthquake, several buildings owned by Newcastle Council had developed cracks. Many of the buildings were in a dangerous state (e.g. the Bolton Street car park) and it was not possible to make physical contact measurements. In this context photogrammetry is very useful, as it is a remote method of measuring.

The photogrammetric team were also contracted by people associated with Scots Kirk, a very old church in Hamilton. This church is situated one street away from Beaumont Street, the worst hit area. This 100-year-old building, for which there are no plans, suffered some fairly severe damage (the bell tower and portico at the front of Scots Kirk had severe cracks). Photogrammetry allowed accurate measurements of the structure of the building to be taken and plans to be developed from the photos of the church.

BLM 20b: Report No. 2

Geological report

An earthquake, measuring 5.6 on the Richter scale, occurred without warning at 10.27 am on the 28th December, 1989 causing loss of life in the city of Newcastle, New South Wales, Australia. This was the first earthquake to cause death in Australia since European settlement.

The epicentre of this event was 15 kilometres west-south-west of Newcastle, near Boolaroo.

Historical seismicity

Earthquake events in the Newcastle area can be traced back to 1837. Subsequent events occurred in 1841, 1842, 1868 and 1925. Since 1960, 55 events with magnitudes exceeding 2.5 on the Richter scale have occurred within 100 kilometres of Newcastle, but none were as close as the earthquake of 28th December, 1989 and none exceeded 4.1.

The nearest continental plate boundary to Newcastle is some 2000 kilometres east, where the Indo-Australian and Pacific Plates collide through New Zealand, Tonga and Vanuatu. Continental Australia is completely within the Indo-Australian plate and is therefore subject to relatively low levels of earthquake activity.

Newcastle is close to the northern margin of the Sydney Basin. The north-east corner of this Basin, near Newcastle, is bounded by fault lines which run in a north-east south-west direction.

One of the more surprising aspects of this earthquake is the almost complete lack of ground deformation. There was no obvious subsidence or extensive ground cracks, despite the added instability from shallow coal mining.

Most observers in Newcastle described the event as more like an explosion lasting no more than two or three seconds. Others, near Hamilton, reported having difficulty in standing and some observed seismic waves travelling down the road or pavement.

Adapted from K. McCue et. al. (1990). The Newcastle NSW earthquake of 28 December 1989. BMR *Journal of Australian Geology and Geophysics*, 11, 559-567.

BLM 20c: Report No 3

Effects of damage

$100 million to fix Government buildings

It will cost more than $1 billion to complete all repair work on the 10 000 buildings that were damaged in the Newcastle earthquake. To complete repairs of public buildings alone will cost more than $100 million and take more than two years.

According to the Regional Manager for Public Works in Newcastle, Denis Pryor, the government departments which suffered the most include the Department of Health ($30 million), TAFE ($27 million) and the Department of School Education ($13.5 million).

More than 300 State Government sites suffered damage, including 160 schools and eight TAFE colleges.

One of the worst hit was the Newcastle College of TAFE campus at Tighes Hill. Here the repair bill is estimated at $18 million.

The combined damage bills for the Royal Newcastle Hospital and the Mater Hospital are close to $13 million.

One year after the event, reconstruction of earthquake-damaged buildings is proceeding well. The work has already started on sixty schools and repairs in half of these are already completed. Kotara High, Plattsburg Public School and Hamilton South Public School were among the most severely damaged.

The historic Newcastle courthouse annex suffered $200 000 damage. Reconstruction of this occurred swiftly as there was no alternative workplace for its employees.

Adapted from Paul Grad, *Engineers Australia,* July 13, 1990.

BLM 20d: Report No. 4

The Newcastle earthquake: My personal experiences

Doc No. EQ1498 (Newcastle earthquake database)

Author: Hawkins, Stella. 77 Oakville Road, Edgeworth, NSW.

Title: *The Newcastle earthquake: my personal experience*

I wish to submit my own personal earthquake experience for your records, as requested.

On the morning of the earthquake, I was in the kitchen washing and wiping the breakfast dishes, standing at the open cupboard, and my adult son was sitting in the lounge room in an armchair, when suddenly the radio went off the air. I looked up in surprise as the house began to tremble violently, accompanied by a loud explosion. Crockery began tumbling from my open cupboard. It was then that my feet took wings. Dropping the tea-towel on the floor, I turned and collided head on with my son. He grabbed me. I screamed out, "Run, it's an earthquake". We made it onto the front porch in record time and turned to see our home vibrating at tremendous speed, it was as though we had double vision. We then ran onto the footpath just as neighbours began tumbling out of their homes. It was like a mad horrible dream, all in slow motion, yet over in seconds...

As we gained our thoughts, a neighbour fetched his trannie, just in time to hear the song, "I feel the earth move under my feet", then the news that the Newcastle Workers' Club had been blown up, among other speculations. Then I remembered our small portable TV set, rigged up for plugging into a car cigarette lighter.We plugged it into the neighbour's ute, as the demolished Workers' Club came into view. The story and pictures of the Newcastle earthquake unfolded before our eyes.

continued …

BLM 20d: Report No. 4 (continued)

Our minds then turned to our loved ones out there somewhere.

My husband was at the time driving toward Cardiff when he noticed people coming out of their homes all along the street. Further along he noticed little groups of people gathering. As he arrived in Valentine, he saw his nephew also standing on the footpath talking, so he stopped to pass the time of day. It was then that he learned of the earthquake. He missed it all.

Some minutes after the quake I took a look at my pets, up till now forgotten; the dogs had settled back down, but the two galahs in the aviary were still clinging screechless to the sides. I ventured back inside the home to be greeted by a mess of broken china, fallen Christmas ornaments, open cupboards, with books and clothes spilling out everywhere.

I do hope my earthquake experience story is of interest.

BLM 21: A community study

Beaumont Street, Hamilton, Newcastle: A community study

History and location

From the mid 1800s Beaumont Street, Hamilton, located three kilometres west of the Newcastle City Centre, developed to become one of Newcastle's first commercial centres. The major period of development began from the late 19th century to the 1920s, with many reminders of this period evident in the buildings which line Beaumont Street. This street has emerged as a commercial centre, one which combines retailing, specialty shops, services, cultural and entertainment facilities. It is most accessible, being served by two major roads, railway and bus services. The railway level crossing directs traffic into Beaumont Street.

Composition of the population

Beaumont Street's special character has been influenced by the local Hamilton population, which has Newcastle's highest proportion of residents from non-English speaking backgrounds. Many cultural groups are represented, significantly people of Italian and Greek backgrounds. Other community groups live in the adjoining suburbs, to the north and east of Hamilton.They, like much of the wider Newcastle population, also patronise this specialty shopping and retail service centre.

An essential function of the Beaumont Street shopping area is to provide a wide range of goods and services for the population of greater Newcastle. This role provides major opportunities for the expansion of businesses in the area as well as attracting other patrons from the wider community and from people visiting Newcastle.

continued…

The earthquake and its effects on business

The Newcastle earthquake of December 28, 1989 has been the most dramatic event in the history of Beaumont Street, bringing loss of life, grief, widespread damage, economic loss and disruption to the local community.

Beaumont Street was closed for five weeks, during which time many businesses closed down or relocated to other suburban shopping centres. Many of the centre's workers lost their jobs and about 10% of the buildings which lined Beaumont Street were demolished. Other buildings were damaged to varying degrees. The remaining businesses face a very long period of reconstruction and economic recovery, their regular clients having altered their shopping habits during the period of reconstruction.

Mr Rossi, owner of the L. J. Hooker real estate agency, said that many of the buildings were constructed over 60 years ago and should be knocked down and replaced. He also warned that rents for shops and homes would rise because of a shortage of properties.

The earthquake and its effects on the residential population

The earthquake affected local residents. A number of residents were forced to leave their homes and the community has been deprived of the centre which provided for day-to-day shopping needs, cultural and personal services. The impact of the earthquake was even more serious for less mobile residents.

The future

There is an urgent need to re-establish the centre's economic life and restore cultural services to the local community. There is a danger that the history and cultural heritage, which are important to the area's future economic development as well as to the local community, may suffer if adequate attention is not given to preserving and restoring those elements of Beaumont Street which make it special.

Source: Adapted from *Beaumont Street Hamilton: Urban Design Study,*
(photographs can be viewed on the Newcastle earthquake site
http://www.infohunt.nsw.gov.au/newcastl/library/eqdb/earthq.htm)

BLM 22

What happened	Geology and earthquake history	Affected areas
Time: When did this event occur: am or pm? At what time of year? (season) Location: Epicentre: Where did this event occur? Was it in or near a built-up area/a remote area/the sea? Magnitude:	Geology: Underlying soils/ rocks. Is the area heavily faulted? Is this area active/dormant? Name of fault: (if known) Type of earthquake: Intraplate/Margin (boundary) Historical seismicity – previous earthquake events. When was the last earthquake? How many times has this place experienced earthquakes?	Size of the area affected: Name the specific area(s) which experienced the most damage: Nearest urban centre to the epicentre: Other areas affected:
Response	**Effects on land and sea**	**Death and destruction**
How did people respond? Response by: Emergency Services: Police: Army/National Guard: Fire Brigade: Aid Agencies: Red Cross, others: State Gov't: Federal Gov't:	Ground failure: (Identify nature of this failure) Vertical movement Horizontal movement Cracking Liquefaction Have pipes broken? Have gas leaks occurred? Fires? Power failures? Has this earthquake triggered landslides? Reports by ships' captains/crew/ divers/people at sea at the time of the earthquake	Buildings: e.g. types of structures damaged (homes, apartment blocks, offices, retail premises, industrial sites) Infrastructure: (services) The estimated no. of buildings damaged: Estimated repair costs: No. of people who died: Injured:

Consequences

State of emergency declared by …?

Do special laws go into effect following a disaster?

Do the laws change? If so, which laws and why?

Counselling for victims?

Initiatives to improve prediction.

How long to rebuild and restore services to pre-disaster levels?

Adapted from: *Features of the Newcastle Earthquake* in Dolan, C.(1995). *Hazard Wise*, Emergency Management Australia, page 91.

BLM 23

What happened	Geology and earthquake history	Affected areas
Response	**Effects on land and sea**	**Death and destruction**
Consequences		

BLM 24

Examples of earthquakes in America

Location	Date	Size	Deaths	Injuries	Property damage
34 0' N 118 10' W Los Angeles (Northridge)	17.1.1994	6.8	57	9 000	$25 b
37 15'N 122 25'W Loma Prieta	17.10.1989	6.9	63	3 757	$5.9 b
34 25' N 119 40' W Santa Barbara	13.8.1978	5.7	0	65	$7.3 b
34 15' N 118 29' W San Fernando	9.2.1971	6.1	58	2 000	$511 m
37 35' N 122 30' W San Francisco	22.3.1957	5.3	0	40	$1 m

BLM 25: Cloze passage

Hint:
Many of the missing words relate to direction. Some missing words are classifying adjectives, such as *southern* or *western*. These words will usually be followed by a noun, e.g. *southern California*. Read to the end of each sentence and think about the purpose of the missing word: is it the name of a place or is it describing or classifying a place? A noun will usually follow words such as *the* or *a*.

Use both maps to complete this task.

Missing words

Note: Some words can be used more than once.

south-east, Santa Monica, Santa Monica Bay, south, west, east, north, southern, Pacific, north-west, San Gabriel, north-east

Los Angeles

Los Angeles is a large multicultural city located on the …… coast of the United States of America, at 34° 00' 118° 10'W. San Francisco, is some 560 kilometres to the……, while San Diego is 209 kilometres away to the…….

Population

The community, originally known as El Pueblo de Nuestra Senora la Reina de Los Angeles de Poricuncula, "the village of Our Lady the Queen of the Angels Poricuncula", was established in 1781 under the direction of the Spanish Governor of California, Filipe de Neve. It became a city in 1850, although its growth was slow until the arrival of the Southern Pacific Railway in 1876 and the Santa Fe Railroad in 1885.

The population of the city of Los Angeles in 1900 was 100 000 and grew to 3.5 million by 1990. By the 1990s it had become the second largest city in the United States, after New York. This rapid growth is explained by realising that the City of Los Angeles comprises the population of the city itself together with the dozens of communities within the Los Angeles County which go to make up what is termed the City of Los Angeles.

Approximately 38% of the city's residents were born outside the US, coming from such regions as Latin America (Mexico) and Asia (Japan, China, the Philippines).

African Americans comprise some 10% of the population, with other groups, like Native Americans, making up the balance.

City organisation

The population of Los Angeles is distributed over an area of 1 204 kilometres.

An extensive network of freeways links these suburban communities which form the city. Approximately one third of the population lives in the San Fernando Valley to the …… of the city. This area is separated from the Civic Centre, the centre of the city, by the Santa Monica Mountains. The suburb of Hollywood is to the …… of the Civic Centre, while Disneyland is to the …… .

Los Angeles International Airport is south of Hollywood and to the …… of the Civic Centre and adjoins …… …… …….

BLM 25: Cloze passage continued…

Topography

Los Angeles has some of the world's most famous beaches, such as Malibu, after which a surfboard is named, and Sunset. Many of the beaches were popularised in songs by the American band, the Beach Boys. L. A. is set on an undulating coastal plain ringed by a series of mountains and their adjoining valleys. The Pacific Ocean lies to the …… and …… of the City. The …… …… Mountains lie to the …… while the …… …… Mountains are found in the north and north-east.

History and development

Following the arrival of the railways in the 1870s and 1880s, newcomers poured into the city. Citrus fruits, like oranges and lemons, thrived with the development of irrigation. From 1890 to 1940 Los Angeles prospered both as a fruit growing area and as a holiday resort. The name Orange County is derived from the orchards in the area.

In an attempt to compensate for its inland location, the city administrators were successful in convincing the US Congress to provide the money for a breakwater, which was constructed at San Pedro between 1899 and 1914, giving Los Angeles the harbour it needed.

As the population grew, the demand for water increased. An aqueduct was constructed to the north, tapping streams which flowed from the Sierra Nevada ranges. In this way, the city of Los Angeles grew, though in a haphazard or unplanned manner.

Oil discoveries in the 1920s, the growth of the motion picture industry in Hollywood, aircraft manufacturing during and after World War 2, and the development of semiconductors, also known as silicon chips, in the 1960s and 1970s, provided a basis for the economic and population growth of the population of Los Angeles.

Land developers created whole new communities, such as Lakeside and Watts, for the growing workforce. These communities were poorly served by urban services and suffered high rates of unemployment, eventually resulting in riots in 1965.

One of the worst riots in U.S. history erupted in south-central Los Angeles in 1992 when four white policemen, charged with the videotaped beating of an Afro-American suspect, Rodney King, were acquitted. Fifty-eight people died as a result of these riots. In 1993, two of these police officers were subsequently convicted for their roles in beating Rodney King, the other two being acquitted.

In October and November 1993, bushfires spread throughout much of the Los Angeles area, destroying thousands of homes. Apart from fires, Los Angeles is subject to significant and frequent earthquake activity, such as the January 1994 Northridge earthquake, which rocked the city, causing billions of dollars in damage and leaving thousands of people homeless.

Adapted from "Los Angeles" Microsoft *Encarta*.

BLM 26: Descriptive report

Descriptive report: self assessment checklist

Read your descriptive report carefully and answer the following questions by putting a tick in one of the boxes.

	Yes	No	Not sure
The text has a classification or general statement.			
The first paragraph includes a preview of the rest of the text.			
The text describes features of the topic.			
The text is organised in paragraphs.			
Each paragraph has a paragraph preview.			
The paragraph preview is elaborated upon in the rest of the paragraph.			
The tense of the verbs is appropriate to the feature being described, e.g. present tense to describe location, past tense to describe the development of the area.			
Technical vocabulary has been used correctly.			
Spelling is correct.			

BLM 27: Life on the edge

The Master Fault

Adapted from:
http://www.scecdc.scec.org/masterfault1.html

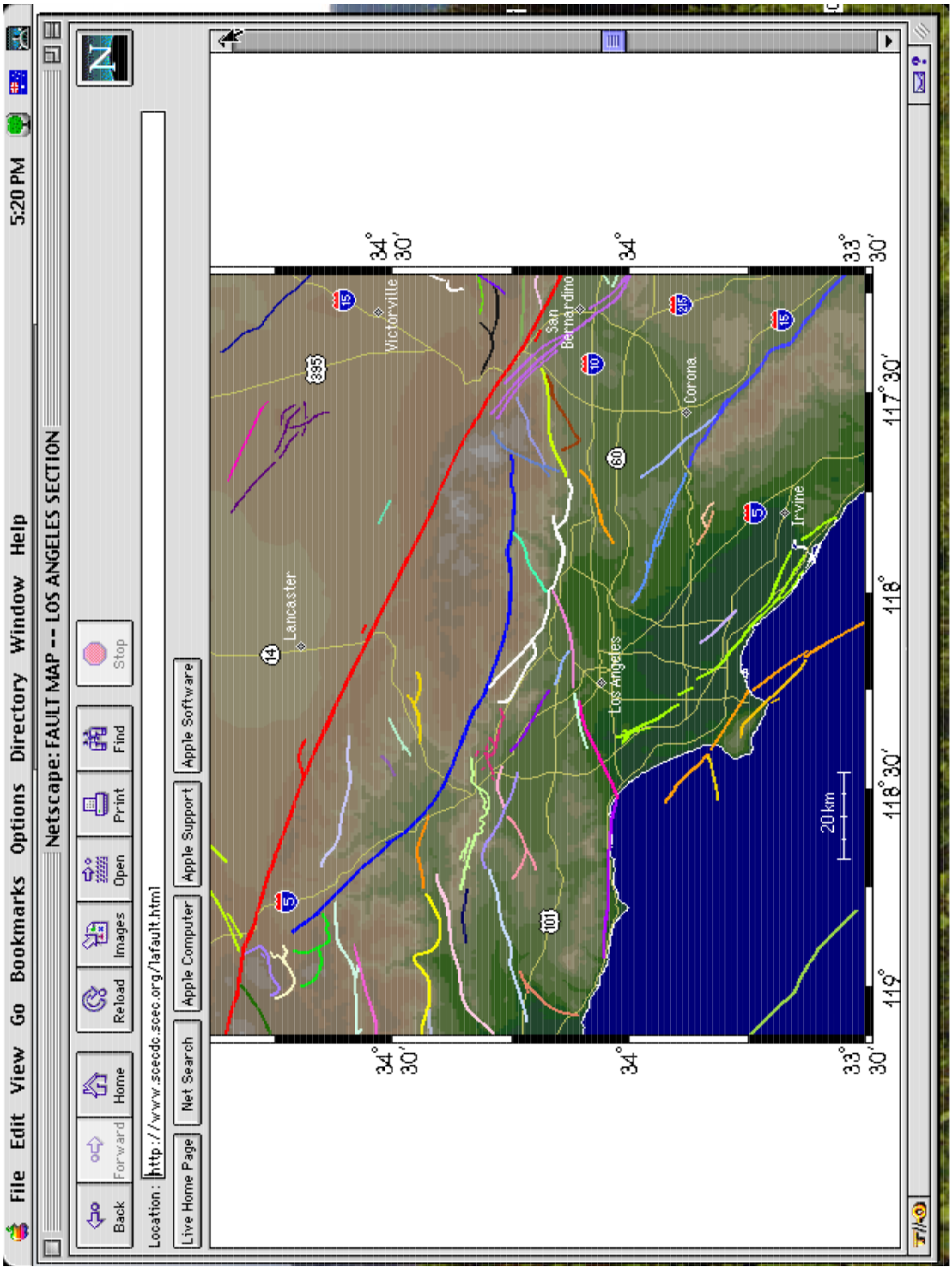
The earthquakes of California are caused by the movement of huge blocks of the earth's crust. Southern California straddles the boundary between the Pacific and North American plates. These large sections of the earth's crust (the North American plate extends east to Iceland while the Pacific plate extends west to Japan) are moving past each other. The Pacific plate is moving north-west, scraping horizontally past North America at a rate of about 45 millimetres per year.

About two-thirds of this 45 millimetres per year occurs on the San Andreas fault system, which includes the San Andreas fault and some parallel faults: the San Jacinto, Elsinore, and Imperial faults. The Newport-Inglewood fault is part of this system but, since its slip rate is so much slower than that of the other four, an earthquake is much less likely to occur in this region. These faults have been studied in greater detail than others because they present such a significant hazard and their level of movement and behaviour make them easily seen at the surface and therefore easier to study.

As part of a re-evaluation of the earthquake hazard in southern California, scientists at the Southern California Earthquake Centre have determined that these faults are so long that they will probably not have one great earthquake extending down the full length of each fault. Instead they will probably have smaller earthquakes on shorter segments. These four faults are among the fastest moving, and therefore most dangerous, in southern California. Over geologic time, these four faults produce about half of the major earthquakes of our region.

However, in southern California, this is not the whole picture. The Pacific plate is moving to the north-west past the North American plate but, unlike central and northern California, much of the plate movement in southern California is not parallel to the San Andreas fault. Between the southern end of the San Joaquin Valley and the San Bernardino mountains, in the so-called "Big Bend," the San Andreas fault bends in a more westerly direction. Where the fault bends, plate motion becomes complex. The Pacific and North American plates no longer run side by side. They push into each other, compressing the earth's crust into the mountains of southern California and producing faults and earthquakes. Half of the major (above magnitude 7) and even more of the "smaller" (less than magnitude 7) earthquakes occur on one of the more than 200 other faults of southern California.

BLM 28: Map


Netscape: FAULT MAP -- LOS ANGELES SECTION
File Edit View Go Bookmarks Options Directory Window Help
5:20 PM
Back Forward Home Reload Images Open Print Find Stop
Location: http://www.scecdc.scec.org/lafault.html
Live Home Page Net Search Apple Computer Apple Support Apple Software
Lancaster
Victorville
San Bernardino
Corona
Irvine
Los Angeles
20 km
34° 30′
34°
33° 30′
117° 30′
118°
118° 30′
119°

BLM 29a

Name of fault	Nearby communities	Slip rate p.a. *
1. Hollywood (white line)		
2. Santa Monica (pink line)		
3. Palos Verdes (light orange)		
4. Newport Englewood (lime green)		
5. Mission Hills (pale pink)		
6. Verdugo (mauve)		
7. San Andreas (orange – red)		

* per annum, meaning each year

BLM 29b: completed table

Name of fault	Nearby communities	Slip rate p.a. *
1. Hollywood (white line)	Hollywood, Beverly Hills, Glendale	< 1 mm p. a.
2. Santa Monica (pink line)	Pacific Palisades, Westwood, Beverly Hills, Santa Monica	< 1 mm p. a.
3. Palos Verdes (light orange)	San Pedro, Palos Verdes Estates, Torrance	Between 0.1 and 3 mm p. a.
4. Newport Englewood (lime green)	Culver City, Inglewood, Gardena, Compton, Signal Hill, Huntington Beach, Newport Beach, Costa Mesa	0.6 mm p. a.
5. Mission Hills (pale pink)	Pacoima, Mission Hills, Granada Hills	0.5 mm p. a.
6. Verdugo (mauve)	Sun Valley, Burbank, Glendale	0.5 mm p. a.
7. San Andreas (orange – red)	Parkfield, Frazier Park, Palmdale, Wrightwood, San Bernardino, Banning and Indio	20 to 35 mm p.a.

BLM 30: Newspaper article

Northridge earthquake

At 4.30 am on 17th January, 1994, some 10 million people in the Los Angeles region of Southern California were awakened by an earthquake that was to be the most costly in the history of the United States. The damage bill exceeded $25 billion. The earthquake, named for its epicentre in the town of Northridge, measured 6.8 in magnitude. It deformed the earth's crust over an area of 4 000 square kilometres, forcing the land upwards in places by as much as forty centimetres. Its effects were felt over 200 000 kilometres of the land area of the United States. In Mexico, some 400 kilometres to the south, the earthquake was also felt. Communities throughout the San Fernando and Simi Valleys sustained heavy damage, as did the surrounding mountains to the north and west of Los Angeles. Seventy-two people died, more than 11 000 were injured and 20 000 were forced to leave their homes. Although moderate in size, the earthquake had an immense impact on people and structures because it was centred directly beneath a heavily populated and built-up area. Thousands of buildings were damaged; 1 600 were deemed unsafe to enter, 7 300 were restricted to limited entry and many thousands sustained minor damage. The ten to twenty seconds of strong shaking collapsed buildings, destroyed sections of freeways and ruptured gas lines that exploded into flames.

Adapted from USGS Response to an Urban Earthquake – Northridge 1994

BLM 31

Geological report

Northridge earthquake

On the 17th January, 1994, an earthquake measuring 6.7 on the Richter Scale occurred on a previously unidentified fault, beneath an urban area, causing loss of life and extensive damage to property.

The earthquake, named for its epicentre in the town of Northridge, occurred beneath the San Fernando Valley on a deeply buried or blind thrust fault at an approximate depth of seventeen kilometres upward to a depth of five kilometres.

The earthquake was felt over some 200 000 square kilometres of the land area of the United States and Mexico. In the US, such places as Las Vegas, Nevada and Turlock in California's Central Valley felt the earthquake, while, to the south, residents of Tijuana, Mexico also felt the earthquake.

The geological setting

The San Fernando Valley and adjacent mountains of Santa Susana to the north and the Santa Monica to the south are part of a geographic area that consists of a series of parallel east-west mountain ranges and sediment-filled valleys. There is an extensive network of blind thrust faults in the Los Angeles basin which, when combined with the position of the San Andreas fault and the north-western movement of the Pacific plate, make this area one of the most seismically active in the United States.

How the earthquake changed the land

The Northridge earthquake significantly deformed the shape of the earth's surface over an area of 4 000 square kilometres. The Santa Susana mountains to the south of Northridge were pushed up at least forty centimetres and in some places by as much as fifty-two centimetres.

BLM 31: Geological report continued…

An uplift of twenty centimetres occurred in Northridge while in the northern part of the San Fernando Valley, the least populated area, the land rose between twenty centimetres and forty centimetres.

Ground failures and landslides

Ground failures refer to and describe the deformation (change in shape), cracking, subsidence and vertical and horizontal displacement of the ground as well as landslides and rockfalls due to the earthquake. These ground failures were responsible for damage to over 7 000 structures, 200 leaks in water pipes and 2 000 breaks in sewerage lines, all within a 24 square kilometre area of Granada Hills and Mission Hills. The earthquake produced many examples of ground failures as far as 90 kilometres from the epicentre.

The most extensive belt of ground failures occurred in the Mission Hills – Granada Hills area. Coincidentally these areas overlie the Mission Hills fault zone. Ground cracks displaced building foundations, fractured swimming pools, broke apart sidewalks and streets and ruptured underground utilities, such as water, gas and sewerage pipes and stormwater drains. To the east of Balboa Boulevard, several areas of ground cracks occurred. These cracks coincided with the path taken by old streams which were subsequently filled in for housing developments, such as those along parts of Bull Creek. Settlements around John F. Kennedy High School and Odessa Avenue have also experienced ground failure associated with landfill.

At Malden Street cracks occurred in an area 500 metres long by 20 metres wide. This resulted in the breaking of sewerage pipes and water pipes. Footpaths and gutters were displaced by up to twenty centimetres.

Additional ground failures occurred along the Pacific Coast from Santa Monica to the Port of Los Angeles. In Redondo Beach, a quay wall moved sideways by some five metres.

Landslides

The earthquake caused thousands of landslides over a 10 000 square kilometre area. Homes were destroyed, roads blocked, power lines and pipes were cut and streams blocked. While widespread and abundant throughout the region, landslides were concentrated in the Santa Susana Mountains to the north of the San Fernando Valley.

Landslides ranged in volume from a few cubic metres to several hundred thousand cubic metres. At Pacific Palisades, near Santa Monica, a house was damaged when part of the cliff on which it was built fell into the sea during the earthquake. In some instances, landslide debris completely filled the bottom of canyons. Material deposited at the bottom of canyons poses a secondary threat because this debris can be mixed with water during storms to produce debris flows, which are common throughout southern California. Their potential is magnified in earthquake-affected areas.

Building and freeway damage

While extensive reinforcement work has been done to many buildings following the disastrous 1971 San Fernando earthquake, there were unexpected failures of other buildings that were supposed to withstand the ground motions associated with an earthquake. As a result, structural engineers and architects, with support from other professionals, have developed a new uniform building code for steel framed buildings.

BLM 31: Geological report continued…

The collapsed elevated portion of Interstate 5/State Highway 14, the interchange between San Fernando and Newhall, was one of the most costly of the freeway failures. Scientists determined that the force of energy from the earthquake was three to four times greater than was expected.

Investigating home damage

The United States Geological Service (USGS) determined that single-storey wooden framed homes built before 1940 suffered the least damage, while those single-storey homes built after 1940, which constituted the largest number of homes, were also very strong and proved earthquake resistant. Multi-storey dwellings (villas, town houses, apartment blocks) tended to suffer the worst damage. Following an earthquake in 1982 in Los Angeles, the LA City Council decided to strengthen unreinforced masonry buildings. One of the success stories of earthquake preparedness was the relative lack of damage experienced by these masonry buildings following the strengthening program undertaken by the City.

There are a number of federal and state laws which contain economic incentives for reducing the damage that can occur from an expected natural hazard, such as an earthquake. People can have their properties assessed by a structural engineer, who will prepare a geotechnical report, a report about the soil and rock conditions which relate to their homes. This report provides the information needed to strengthen a home and therefore reduce the level of damage to property, should an earthquake occur.

Armed with this information, home owners can make informed choices about personal safety and the likelihood of damage to their properties, based on the knowledge that they live in a known earthquake area.

Hazard maps

In addition, people need information. Information is provided by government organisations like the United States Geological Services. This organisation prepares seismic hazard maps. These maps make the link between research on earthquakes and hazard mitigation: that is, where earthquakes are likely to occur and what steps can be taken in an area to reduce the damage that is likely to be caused by an earthquake. These seismic hazard maps are the basis for the Uniform Building Code. This code sets minimum standards which must be followed if people want to be able to insure their house and property, when building in a known earthquake-prone area. Insurance companies use these hazard maps to set insurance premiums on properties. For example, many areas of Los Angeles are heavily populated. As this area is also one of the most geologically active in the United States, scientists have an excellent level of knowledge about some of the faults which occur in this area and are able to work out the likelihood of a place experiencing an earthquake. The area of highest seismic hazard is near San Bernardino, which is next to the San Andreas and San Jacinto faults. It is likely that a major earthquake, above 7.0 in magnitude, will occur within the next 50 years in this area. Another area which is likely to experience a major earthquake extends south from Santa Barbara to the northern part of the San Fernando Valley and the mountains which border this area, the Oak Ridge and Santa Susana Mountains.

What has been learned?

As a result of the Northridge earthquake, the USGS, together with other government departments, at state and local levels, and businesses are providing information, on a continuing basis, to people as they move into and out of different known hazard areas.

BLM 31: Geological report continued…

Examples of what can be and is being done include the following.

- The National Earthquakes Hazard Reduction Program was established in 1977.
- Information about earthquakes is distributed rapidly to other government departments, emergency response organisations (fire brigade, ambulance, gas company, water board, electricity companies), transport firms and others immediately affected by the earthquake.
- A network of seismographs to record earthquake events has been set up.
- Scientists and engineers have prepared "shaking intensity" maps. These maps show the estimated severity of shaking and the levels of damage associated with such shaking. When combined with effective communications networks, the people who are responsible for coordinating the relief effort are able to locate the areas hardest hit by the earthquake and send appropriate help. The "shaking intensity" map was the first use of such a map to help focus relief efforts during a disaster.
- CUBE, or the Caltech / USGS Broadcasting of Earthquakes, automatically reports earthquakes recorded by the 350-station southern California seismograph network operated by USGS and Caltech. The elapsed time between the earthquake occurring and knowledge of the location, time and magnitude is between one and two minutes.
- The USGS produces special publications such as *Reducing earthquake losses* throughout the United States. This information can also be obtained via the Internet at http://quake.wr.usgs.gov
- *Putting Down Roots in Earthquake Country* is a 32-page booklet that is produced by the Southern California Earthquake Centre and the USGS. The site address is: http://scec.gps.caltech.edu/roots/roothome.html
- The Californian Government, through the Seismic Safety Commission, its work with the USGS, and FEMA, the Federal Emergency Management Agency, produces a series of five-year plans that are designed to apply the findings of scientific research to a program of reducing earthquake hazards through updating the building code and making new laws and amending old laws.

BLM 32: Summaries

Text 1: The Los Angeles dam story

The Lower San Fernando Dam nearly failed following the 1971 earthquake. A new dam, the Los Angeles Dam, was constructed upstream. This report details the effects of the Northridge earthquake on the Los Angeles Dam.

Text 2: Life in Los Angeles three days after the earthquake

Provides a snapshot of life in L. A. following the earthquake. It also includes an example of the level of community involvement of the Sears Logistics and Merchandising Company.

Text 3: Six days after the earthquake

Deals with the establishment of tent cities throughout the region.

Text 4: The trouble with disaster aid

In previous natural disasters that have struck the US, either the response of the Federal Government and its agencies has been too slow or they have provided insufficient funds to rebuild communities. With Northridge, they are being accused of wasting public money.

Text 5: A sudden case of the shakes

Identifies some of the different ways in which people's behaviour has changed as a result of the earthquake. The article also deals with the tragedy which eventually united two people.

Text 6: Nearly one year later – ghost towns

This term is used by authorities to describe abandoned homes which have been taken over by the homeless, prostitutes and vandals. It also deals with one family's efforts to keep their home and government efforts to protect other people's property.

Text 7: Is there no end in sight?

Four years after the Northridge earthquake some people still aren't able to return to their homes because of protracted disputes with their insurance companies over the cost of repairs.

BLM 33: Text 1

The Los Angeles dam story

The near failure of the Lower San Fernando Dam forced 80 000 people to evacuate their homes following the 1971 San Fernando earthquake. The forty-seven-metre-high dam was perilously close to failure; only a thin wall of dirt stood between 80 000 people in the San Fernando Valley and the fifteen million tons of water held behind this dam. Residents in a 30 square kilometre area were evacuated while the water level behind the dam was lowered – a process that took three days.

The dam was so heavily damaged that it could not be repaired to the standard of safely holding its water supply during another large earthquake. Scientists from the US Geological Services realised that any replacement dam needed to withstand shaking at least three times stronger than that assumed in earlier design studies. The new $33 million Los Angeles Dam and Reservoir was constructed one kilometre upstream from the existing Lower San Fernando dam. The Lower San Fernando dam was reconstructed to provide a holding basin for stormwater and to back up the new dam.

Two decades later, the Northridge earthquake put the new Los Angeles dam to the test. The Northridge earthquake, which had a magnitude of 6.7, was similar in magnitude to the San Fernando event. Ground shaking was very strong with measurements among the highest ever recorded. Despite the intense shaking, the crest of the dam moved only 2.5 centimetres sideways and settled only 9 centimetres. In contrast, the Lower San Fernando Dam again suffered heavy damage.

Article adapted from *Reuters Business Briefing*, Matt Spetalnick, 20/01/1994

BLM 34: Text 2

Life in Los Angeles three days after the earthquake

Thursday

Thousands of earthquake victims jammed federal disaster centres, which were established in car parking lots and on vacant land, seeking emergency aid and the opportunity to begin rebuilding their lives.

The following is a snapshot of life for some L. A. residents:

- The city's new 20 000 homeless, half of them children, shivered through another cold night in makeshift tents erected in parks and on vacant lots.
- Hospitals tried to cope with the 4 800 injured as a result of the earthquake.
- Car trips, that normally took 45 minutes to complete on freeways, took 4 hours. Drivers will have to get used to waiting. It will take up to 18 months to repair the damaged freeways.
- Consumer affairs telephone lines ran hot as complaints about "price gouging" streamed in: $6 for a litre of milk, $65 for a pizza. Authorities have reactivated a law which makes it a crime to increase prices by more than 10% during a state of emergency. By Saturday, 22nd January, 100 San Fernando Valley shop owners had been charged with this offence.
- A Las Vegas T-shirt man came to Los Angeles to sell Martin Luther King Day T-shirts. He had few takers until he changed the message to read: "Thank God I survived California's 6.8 Earthquake". Sales boomed…

- The temperature dropped to approximately 8ºC, sparking fears that the cold damp weather, for the third day, would contribute to respiratory illnesses amongst the old and very young.
- Thousands of homes remained without water and electricity.
- Sears, a very large company, offered the American Red Cross the use of its 90 000m^2 distribution centre in Vernon, a suburb to the east of downtown Los Angeles.
- Sears donated flashlights, batteries, blankets, sleeping bags, jumpers, towels and pyjamas valued at over $100 000. This was in addition to the $100 000 already donated to the Red Cross.
- As Sears stores remain closed in the affected area, Sears is helping to find its employees work at its other stores in the region.
- Ten trailers full of water, valued at $84 000, were distributed to employees and the local community.
- All employees who worked in the Northridge and North Hollywood stores will have the opportunity to return to these places of work, when they reopen.
- Temporary shopping passes were issued to Sears customers whose credit cards were lost or destroyed during the earthquake.
- Sears service technicians will help customers assess damage to their household items and appliances resulting from the earthquake.
- American Red Cross vouchers are being accepted at Sears stores.

Adapted from PR Newswire, *Reuters Business Briefing,* 2/2/1994

BLM 35: Text 3

Six days after the earthquake

To accommodate some of the thousands of people left homeless by Monday's earthquake, the National Guard established a number of tent cities throughout the region to provide temporary shelter and food, as well as toilet facilities, showers and power. Canoga Park is one such example and accommodates 1 500 newly homeless, with the other 8 500 being housed in five other tent cities scattered throughout the region.

Another 9 000 earthquake victims were living in shelters set up in community centres and halls run by the Red Cross, Salvation Army and other authorities.

With weather forecasters predicting rain, fears of other natural disasters, mudslides and flooding loomed. Two hundred and fifty residents, who had made their home in what was known to be a flood-prone park in Van Nuys, were bussed, along with their few possessions, to higher ground and safety.

Many of the park dwellers, authorities say, have homes that, while damaged, are still habitable, but residents are too frightened to return. This was Maria Saldano's experience. Maria fled her apartment after the initial earthquake. Her temporary home was a park in Northridge. She returned to her unit a few days later, but fled in terror as a 4.6 aftershock hit.

Article adapted from "Thousands of Quake Homeless Move Into Tent Cities", Michael Miller, 23/1/1994 in *Reuters Business Briefing*, Reuters News Service

BLM 36: Text 4

The trouble with disaster aid

The United States has suffered its fair share of natural disasters recently, including earthquakes, hurricanes and fires. But "disastrous" also might be a fairly accurate term to describe the Federal Government's response to such events.

The Federal Emergency Management Agency (FEMA), the department responsible for coordinating the nation's disaster relief efforts, has been singled out for criticism.

After Hurricane Hugo tore through the east coast in 1989, Senator Ernest Hollings called FEMA officials "a bunch of bureaucratic jackasses" and suggested abolishing the agency altogether.

In 1992 Hurricane Andrew destroyed 17 000 homes in South Florida. Disaster relief agencies were cited for delays in getting food and shelter to the tens of thousands of South Florida victims left homeless by the storm.

Stung by the criticism, officers from FEMA have bent over backwards to streamline, expand and speed up their efforts to assist victims of the 1994 Northridge earthquake.

The $8.6 billion earthquake relief package, which is yet to be approved by the US Senate, is the largest ever given by the Federal Government and comes on top of $900 million already released to deal with the emergency.

BLM 36 continued…

Of this $8.6 billion, $5.1 billion will be directed to FEMA, $1.35 billion towards low-interest loans from the Small Business Association, $1.35 billion to highway funds, $575 million to housing assistance from the Department of Housing and Urban Development, with $500 million being left as a reserve. Most of the money will be used to rebuild public infrastructure, schools, hospitals and damaged utilities. Substantial sums, totalling $1.3 billion, are also being distributed to individuals as well.

"The immediate response of the federal agencies to the needs of the earthquake victims was swift and unprecedented," said Senator Barbara Boxer, Democrat California. "Federal officials were on the scene quickly, outlining assistance and opening (disaster relief) centres."

But some analysts have expressed concern that, in responding to criticisms of foot-dragging in previous disasters, federal agencies may be too generous this time.

In its efforts to get money to victims as quickly as possible, FEMA has sent hundreds of disaster cheques to people whose homes are livable, some of whom say they never asked for the housing assistance. FEMA sent these cheques to people in hard hit postcode areas who had either called an emergency hot line or had applied for aid at a disaster assistance centre.

Morrie Goodman, FEMA's director of public affairs, insisted that no errors were made. "Anyone who says an error was made doesn't know what they are talking about. We've had people living in parks and in the shelters who needed immediate help so they could get out of those parks and into shelter somewhere", he said.

The Department of Agriculture is responsible for the supervision and distribution of emergency food stamps. Immediately after the quake, it lifted its standard screening procedures and was flooded with tens of thousands of applications, many believed to be fraudulent. After several days, officials reimposed most of the normal screening provisions amid reports of double dipping and the padding of claims.

Nineteen L. A. County welfare employees who process claims for earthquake-related benefits are under investigation on charges that they filed false applications for food stamps.

Some Federal aid has left some victims better off than they were before the earthquake. After learning that the Department of Housing and Urban Affairs would pay 86% of its rent costs for the next 18 months, one family moved from a run-down earthquake-damaged Hollywood apartment that rented for $400 per month, to one renting for twice that much.

What some people discovered is that they don't have to be deprived to receive assistance, just savvy about exploiting the government. One Woodlands Hills family, with a combined income of $67 000 and savings of $15 000, was told by a Savings Bank official that they were eligible to receive a low interest loan to replace a personal computer damaged in the earthquake.

Adapted from *Investor's Business Daily,* Jesse Malkin, 11. 2. 1994

BLM 37: Text 5

A sudden case of the shakes

Many who have survived the 6.8 earthquake are suffering sharp and lingering emotional tremors. The original shock and panic for some has given way, in other cases, to delayed shock, numbness and a constant feeling of anxiety.

Sherry McClure, 26, a bank worker in Northridge, sleeps on the kitchen floor, ready to roll under the table when necessary. Phoebe Sharaf, a Santa Monica social worker, refuses to go to the movies because she fears dark enclosures.

According to an executive at Bekins Moving and Storage Company, January is normally their slow period, but they're seeing an increase in business from people wanting to leave the area.

With each of the aftershocks, which have totalled more than 5 000 of varying intensity, the fears of some have assumed a pervasive and even obsessive quality. One store reported a sudden boom in $2 000 steel canopy beds capable of withstanding "an entire collapsing roof".

This was the experience of the sixteen first floor residents who perished in the Northridge Meadows apartment complex in which Mike Kubeisy, a third floor resident, also lived. The earthquake jolted the three-storey apartment block off its foundations and flung it back down with such force that the first floor collapsed.

Though his apartment door was wedged shut, he managed to squeeze into the hallway through a crack in the wall. Meanwhile, down the hall, Tricia Silden, an office manager with a law firm, who had moved into the building shortly before her 1992 divorce, was trapped in her apartment. She was on the balcony, preparing to jump when, through the darkness she heard a vaguely familiar voice. They called to one another.

Mike was able to find a ladder, which he held in place until Tricia was safely on the ground. This may have been the end to this particular story were it not for a chance meeting, several weeks later, at a get-together for survivors organised by the local Methodist Church. Afterwards, they strolled together, got a soda and chatted. They ran into one another at the Northridge Meadows complex in early February, when they were told they could collect their belongings from the unsound structure. Mike wandered over to say goodbye and said, "If ever you feel like having a chat, ring me." It was he who rang. By June, they were roller blading together, and not long afterwards they were married.

Adapted from *Time* magazine, March 14,1994 by Jordan Bonafante. Vol.143, Issue 11, p. 36. Item Number 9403087832 and an article entitled "The Earth Moved" by Karen S. Schneider with F.X. Feeney. *People* magazine, Vol. 43, Issue 3, p. 47. Item Number 9501187546, January 23, 1995.

BLM 38: Text 6

Nearly one year later... ghost towns

In the Hollywood Hills district, almost all the sixty-eight buildings in Carlton Way were damaged. Twenty-three of them remain vacant today. While Al DeFrancisco, a retired restaurant owner, survived the 6.6 tremor, the eighty-four year-old home in which Al had lived for thirty years did not fare as well. It jumped 1.2 metres off its foundations. Inspectors later deemed it unsafe to enter.

No sooner had Al moved out than vagrants started moving in, taking over his house and those of his neighbours. Before long, prostitutes, drug addicts and runaways owned the neighbourhood. To reclaim and protect his property, DeFrancisco and his son took turns to patrol the area. One night he fired his gun into the air to scare off a dozen or so squatters who were making a noise in front of his collapsed porch.

It is now December, eleven months since the earthquake. DeFrancisco's neighbourhood is a "ghost town". This is the official designation for the pockets of extreme damage scattered within a twenty-seven kilometre radius of the Northridge earthquake.

It's anyone's guess when the rightful owners will be able to return, if ever. Meanwhile the empty buildings have given looters, drug addicts and the homeless free lodgings. The threat posed by the illegal occupation of countless buildings has spurred the authorities into action. In recent months, the L. A. Housing Department has sealed off more than 500 ghost town properties and 17 000 residential units and hired private security firms to keep intruders out of other properties.

DeFrancisco hasn't fired his gun in months. "It's been quiet here lately", he says. Just down the road, the sounds of children are heard. The local Montessori school has just reopened.

Report adapted from Jim Impoco (1994). "Blade Runner comes to Los Angeles". *US News and World Report,* Volume 117, Issue 25, page 91, 26 December.

BLM 39: Text 7

Is there no end in sight?

For the past four years life for Wanda Raynard, a 72-year-old widow, has been a nightmare. The images of gas flares, downed power lines, cracked water mains and sewerage pipes, caused by the Northridge earthquake, have all but faded from the memory of many Los Angeles residents.

Since 1994, Wanda has lived in a rented house, unable to return to her home of 39 years because of a drawn-out dispute with her insurance company over the cost of earthquake repairs.

There are hundreds of cases, similar to that of Wanda, which remain unresolved. Nevertheless, more than 90% of homes damaged by the earthquake have been repaired, largely because of special loans provided by the State and Federal Governments.

The case of unfinished repairs is not confined to private homes and units. Some two-thirds, or 5 000, of the public buildings for which Federal repair funds were sought, including schools, hospitals, police stations and government buildings, have yet to have repairs completed.

In many cases the delay is due to indecision by government bodies on how to proceed. It took almost three years of debate and investigation before the Los Angeles City Council approved a five-year $273 million seismic retrofit and rehabilitation program for the 72-year-old City Hall. In November 1997, approval was finally given to replace the badly damaged USC Medical Centre, the nation's busiest hospital. This new hospital is expected to be completed by 2004, the 10th anniversary of the Northridge quake.

At Wanda Raynard's home, the earthquake cracked walls and shook loose asbestos from the ceiling contaminating her clothes, furniture, dishes and most of her appliances, all of which had to be thrown away. Over the last four years, thirteen loss adjusters have been assigned to her case, each one offering a different settlement.

She believes that her insurance company is short-changing her by $100 000, the amount she needs to replace all the things damaged and destroyed by the earthquake.

Many home owners are in dispute with their insurance companies over the cost of repairs. Frequently loss adjusters from the insurance company assess damage that can be seen. When the repairs begin, damage that wasn't previously visible becomes apparent, requiring a further claim for the initial damage caused by the earthquake. In other instances, some insurance companies are relying on a clause in their insurance policy which states that home owners have one year after an earthquake to file a damage claim, even if an insurance company's loss adjuster overlooked serious damage.

Insurance Commissioner Quackenbush indicated that cases like Wanda's were not unusual. Nor was it unusual for home owners to file another claim following one that had already been submitted. Earthquake damage is often not visible to a home owner and, for that matter, may not be visible to an adjuster, until later repairs uncover more extensive damage.

Adapted from: Martin, (1998). "4 years after Northridge, recovery isn't over", *Los Angeles Times*, 11/1/1998 and a press release from the California Department of Insurance entitled " Commissioner Quackenbush unveils plan to help Northridge earthquake victims with late notice earthquake insurance claims."
The press release is located at:

http://www.insurance.ca.gov/PRS/PRS1997/Pr032-97.htm

BLM 40

Use this outline to guide your note-taking.

What happened	Geology and earthquake history	Affected areas
Time: When did this event occur: am or pm? At what time of year? (season) Location: Epicentre: Where did this event occur? Was it in or near a built-up area/a remote area/the sea? Magnitude:	Geology: Underlying soils/ rocks. Is the area heavily faulted? Is this area active/dormant? Name of fault: (if known) Type of earthquake: Intraplate/Margin (boundary) Historical seismicity – previous earthquake events. When was the last earthquake? How many times has this place experienced earthquakes?	Size of the area affected: Name the specific area(s) which experienced the most damage: Nearest urban centre to the epicentre: Other areas affected:
Response	**Effects on land and sea**	**Death and destruction**
How did people respond? Response by: Emergency services: Police: Army/National Guard: Fire Brigade: Aid agencies: Red Cross, others: State Gov't: Federal Gov't:	Ground failure: (Identify nature of this failure) Vertical movement Horizontal movement Cracking Liquefaction Have pipes broken? Have gas leaks occurred? Fires? Power failures? Has this earthquake triggered landslides? Reports by ships' captains/crew/ divers/people at sea at the time of the earthquake	Buildings: e.g. of types of structures damaged (homes, apartment blocks, offices, retail premises, industrial sites) Infrastructure: (services) The estimated no. of buildings damaged: Estimated repair costs: No. of people who died: Injured:
Consequences		
State of emergency declared by …? Do special laws go into effect following a disaster? Do the laws change? If so, which laws and why? Counselling for victims? How long to rebuild and restore services to pre-disaster levels? Initiatives to improve prediction.		

Adapted from: *Features of the Newcastle Earthquake* in Dolan, C.(1995). *Hazard Wise*, Emergency Management Australia, page 91.

BLM 41: Northridge earthquake

Read the texts you have been provided with and record the information on the table below.

What happened	Geology and earthquake history	Affected areas
Response	**Effects on land and sea**	**Death and destruction**
Consequences		

Chapter 5: Planning a whole-school approach to literacy

This chapter should be read in conjunction with *Planning a whole-school approach to literacy*, NSW Department of School Education, 1997, which has been written to help schools to plan for literacy improvement by:

- interpreting and using Year 7 ELLA results as a basis for future planning
- evaluating the effectiveness of current literacy strategies
- assessing staff expertise in relation to literacy
- identifying, assessing and using available resources
- refining or modifying organisational or administrative structures
- refining or developing whole-school literacy plans.

This chapter outlines the key steps which schools should undertake as they work towards developing a whole-school approach to literacy and then suggests ways in which the geography staff can contribute to this process.

Establish literacy as a school priority

At faculty and whole-school meetings, discuss and develop understandings about the literacy demands of various KLAs and subjects. The district literacy team can provide advice to faculty groups about ways to identify and describe these literacy demands.

Focus on literacy makes a useful starting point for meetings and professional development activities related to literacy. It addresses the key elements of the State Literacy Strategy and provides information about the effective teaching of literacy in an explicit and systematic manner.

Chapters 1 and 2 of this book describe in detail the literacy skills, knowledge and understandings which students in Year 7 need to demonstrate in order to be successful. They also outline the prior knowledge and skills which students bring to the secondary school by looking at the literacy experiences and demands of the primary school.

Having established an understanding of the literacy demands of each subject, teachers should then examine their teaching programs to identify opportunities for systematic and explicit literacy instruction.

The literacy support team in the school can assist in highlighting opportunities to develop students' literacy skills in each subject. Support teachers such as ESL, STLDs and teachers and teacher-librarians should be involved in providing advice about specific strategies.

The school as a whole needs to recognise the value of a whole-school approach to literacy and to ensure it becomes part of the school management plan. Ways of meeting the professional development needs of individual teachers and faculty groups should be included in the plan. Teachers could be surveyed to establish their current knowledge and expertise. *Planning a whole-school approach to literacy*, Appendix 1 is an example of a survey.

Determining priorities within the plan

In order to develop an appropriate literacy plan for the school, information about students' current literacy achievements needs to be analysed. The ELLA results can provide useful information about individuals' and cohort groups' strengths and weaknesses. An analysis of the areas in which students require additional support will suggest a focus for the plan. Other information may be gathered by analysing School Certificate and Higher School Certificate results. Data gathered by teachers through informal and formal assessment tasks will also highlight areas needing support. Having collected and analysed all available data, the staff should determine priorities within the school plan. These priorities should also reflect the State Literacy Strategy.

Developing goals or objectives for the school plan

These priorities should then be translated into outcomes for students and teachers. These outcomes need to be written in language which is explicit and defines precisely what is to be achieved. Some outcomes will relate to short-term achievements while others will be long-term. A short-term goal may be that all teachers have been trained in the NPDP modules, *Literacy across the KLAs, Years 7 & 8* or the NPDP CD-ROM, *Literacy for learning,Years 5-8* .
A long-term goal might be increased numbers of students continuing to study geography to Higher School Certificate level.

Some of the goals will have implications for teachers' professional development, and this will need to be documented in the plan, including what form the professional development will take, how it will be provided and how it will be funded.

Sample survey from: *Planning a whole-school approach to literacy*, Appendix 1.

(A)1: Literacy survey of staff

Name: _____

Remember: Literacy includes reading, writing, speaking and listening in a range of contexts.

1. List any formal training qualification in literacy

(a) Preservice _____

_____

(b) Inservice _____

_____

2. Do you have any other relevant training that could be useful in the literacy area at this school? e.g. public speaking, writing, acting, computing…

_____

_____

3. In the area of literacy, list any skills that you feel would be of value to others in the work place. _____

_____

_____

_____

4. Are you a member of any professional organisations that have literacy as a component? If so, please list.

_____

_____

_____

5. List any literacy resources and/or strategies of which you are aware that could be used to benefit teachers and students at this school.

_____

_____

_____

6. What classroom literacy activities do you use in your classroom?

Sometimes	Often	Regularly

(a) What literacy programs or strategies do you think have been successful at this school?

_____

_____

_____

(b) Why?

_____

_____

_____

8. (a) What literacy programs or strategies do you think have not been successful?

_____

_____

_____

(b) Why? _____

_____

_____

_____

Thank you for taking time to complete this survey.

Resourcing the school plan

Collect information about available resources, both human and material. This will include the expertise which already exists within the staff and the district. It will also include surveying and collecting information about literacy programs which are already in the school. Appendix B in *Planning a whole-school approach to literacy* offers one way of doing this. Determine which programs are achieving their outcomes and are aligned with the outcomes of the school plan. Decide whether additional resources will be required to achieve the outcomes of the school plan. If additional human resources are needed, how will these be found?

Will it require a more flexible organisation of the school timetable? If additional material resources are required, how can these be budgeted for in the school plan? Ensure that all staff have the opportunity to provide input to the resourcing of the plan.

Informing parents and the community

Parents and community members could be involved in developing the school plan. Participants could be drawn from the P & C, local community groups or parents who express a particular interest. All parents and caregivers should be kept informed of the development and progress of the plan through parent meetings and newsletters. It might be necessary to provide this information in a range of community languages. When reporting on student achievement, each KLA should include information about literacy achievements and indications of areas requiring additional support. The nature of the support being supplied by the school should be indicated.

Evaluating the plan

Procedures for evaluating the overall success and the outcomes of the plan should be established and written into the plan. For long-term outcomes, indicators may need to be established to ensure that the school is working purposefully towards the achievement of those outcomes.

The following case study provides an example of how one school set about establishing a successful literacy plan.

Sample from:
Planning a whole-school approach to literacy, Appendix B.

(B) Mapping Existing Programs and Strategies

Step 1: *List all literacy programs and strategies operating in the school.*

Step 2: *For each strategy or program, you may wish to ask some of the following questions or you may wish to include others.*

1. What is the program?
2. When was it developed?
3. Is it still current?
4. For whom was it designed?
5. Is it achieving its stated outcomes?
6. How do you know?
7. How is it implemented?
8. Is it used by all people who should use it?
9. Is it part of whole-school planning?
10. Is it part of financial planning?
11. Is it simple, practical and reliable?
12. Does it fit in with current DSE Policy?
13. Are there adequate resources for the program?
14. Is it supported by training and development?
15. Has it influenced student participation in teaching and learning outcomes?
16. How do you know whether or not it has made a difference to student learning outcomes?

A geography faculty approach to literacy

Getting started

Steps	Things to consider
1. Introduce literacy	• Why is literacy important? • What is the literacy approach of the whole school? • What is the role of geography teachers? • What support is available for geography teachers?
2. Identify literacy needs in geography	• What are the demands of geography? • What literacy skills are required of students in geography? • What literacy skills, knowledge and understandings do Year 7 students bring with them from primary school?
3. Become familiar with text types	• What are text types? • What text types are used in geography?
4. Identify literacy strategies	• What teaching and learning strategies develop literacy skills? • What strategies are most appropriate for geography?

Organise a faculty meeting.

Invite:
- *school literacy coordinator*
- *district literacy consultant.*

Examine geography syllabus outcomes.

Link with your feeder primary schools.

Use the NPDP CD-ROM, Literacy for learning, Years 5-8.

Collect a range of strategies and examples.

See Chapter 4 in this document.

Putting it together

Steps	Things to consider	
1. Develop an action plan	• What are we trying to do? • What needs to be accomplished? • What literacy skills should we focus on in our geography programs? • What resources are available to the faculty? • Where will we start? • How will we know that we are making a difference?	*Discuss in faculty meetings.* *Link in with the whole-school literacy plan.*
2. Start with a current unit of work	• What do we expect students to be able to do at the end of the unit? • What literacy skills are needed to achieve the outcomes? • What literacy strategies are already in place? • Where could other literacy strategies be included in the unit? • What assessment methods can be incorporated? • How will we monitor the unit?	*Select one unit of work to start with.* *Revisit geography outcomes and identify literacy strategies.*
3. Strengthen other units of work	• What unit of work will we work on next? • Who will be responsible for rewriting each unit? • What is our timeline for development? • How will we monitor each unit?	*Discuss at regular faculty meetings.* *Allocate tasks within faculty.* *Use literacy consultants for support.*

Making it work

Steps	Things to consider
1. Implement the units of work	
2. Collect evidence	• How best can we use student work samples? • What types of anecdotal evidence can we collect? • What formal assessment tasks should we include in each unit? • What other types of information can we collect about student achievement?
3. Evaluate the units of work	• Do the literacy strategies relate to the unit outcomes? • Have we addressed all literacy areas (reading, writing, talking and listening) in our units? • Have we catered for all students? • How much time is spent on developing literacy in the geography unit? • Has students' achievement of outcomes improved? • What can we do better next year?
4. Some personal reflection	• Where have I focused my development in literacy? • What do I already know? • What have I overlooked? • What skills do I have in the literacy field that will be of benefit to others? • What skills and knowledge of literacy do I need in order to do my job better?

Teach the units of work.

Identify formal and informal assessment strategies.

Use pre-planned evaluation strategies.

Discuss at faculty meetings.

Link to whole-school plan.

Take time for some individual reflection.